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# Essentials of Insect Control

By J. J. Davis

Purdue University Agricultural Experiment Station

IF I WERE asked to name the reason for ineffective control of orchard insect pests, I would immediately answer, "Lack of thoroughness." But on further thought, I might add that a second reason is lack of a knowledge of insects and the underlying principles of insect control.

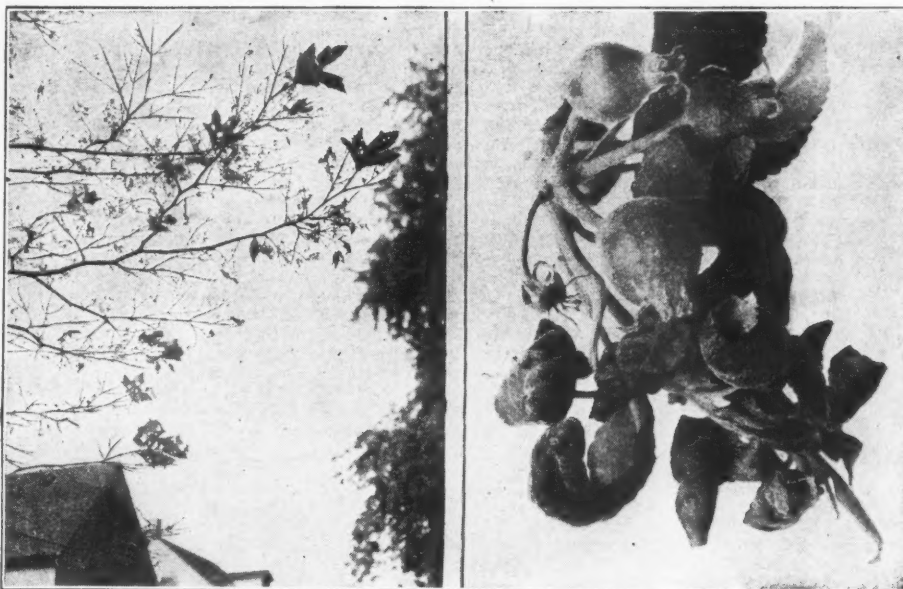
The greatest achievements of the agricultural experiment stations the past 10 or 15 years have consisted in the development of control methods for insects and plant diseases. And yet, there remain more unsolved problems in entomology and plant pathology than in any other field of agriculture. Regardless of these achievements, the insect losses in the United States amount to more than two billion dollars, which is eight times the annual property loss by fire, more than 25 times the annual income of all the colleges in this country, and 100 times greater than the funds allotted annually to the United States Department of Agriculture for all agricultural work. With our present knowledge of insect control, more than half, probably 75 per cent, of this loss could be avoided by practical methods if more growers understood the principles underlying insect control and intelligently utilized the known means of control. This is true because many orchardists, gardeners and general farmers follow dogmatically the general spray or other recommendations and fail to understand the underlying principles, a knowledge of which would be of greatest value in adapting recommendations to special conditions.

## Knowledge of Feeding Habits Essential

First of all, the grower

should understand the fundamentals of structure and development of insects, which is essential to a proper understanding of insect control. He should be able to recognize from an examination of the insect or its injury the kind of mouth parts it possesses and understand the relation of mouth parts to type of insecticide to be used. Insects with chewing mouth parts, which chew off plant tissue and take it into the stomach, are usually controlled by stomach poisons, such as arsenate of lead. Insects with suck-

ing mouth parts take only the sap of the plant into their stomachs and therefore cannot be affected by stomach poisons but instead must be reached with insecticides which kill directly or indirectly by contact. The up-to-date grower must understand how insects develop and live in order to be able to plan his orchard practices most intelligently. He must understand the nature of insecticides and how insects react to them if he is to secure the greatest effectiveness.



Left.—Insects with chewing mouth parts consume the plant tissues and sometimes defoliate the plants. Right.—Insects with sucking mouth parts devitalize the plants by sucking the plant juices from the leaves or bark. Their presence on leaves is often indicated by a curling or spotting of the leaves

## Three Essential Steps in Insect Control

In introducing the subject of insect control, we must first recognize three essential steps, which might be likened to the three steps followed by a physician in his practice of medicine. These steps are (1) diagnosis; (2) prescription; and (3) application. We must first of all diagnose the trouble, that is, determine the insect responsible for the trouble, and this may be done by an examination of the insect itself or by the injury. Diagnosis calls for a knowledge of the classification of insects and types of injuries inflicted by the commoner insects. The second step—prescription—is the remedy, and this is based, first, on the results of diagnosis and, second, on our knowledge of the life history and habits of the insect. The prescription is not necessarily routine, for while there may be recognized specific remedies for this or that insect, a knowledge of the conditions often calls for special recommendations based on the conditions. The third step, or application, is dependent on the operator. Too much emphasis cannot be placed on this last step. The diagnosis may be correct and the operator may use the right material and have the best of appliances but unless he applies the spray or uses the control at the right time and is thorough in his treatment, he may find that the insects continue to damage his crops in spite of his efforts. We could give any number of instances to show the importance of thoroughness. For example, a few years ago an orchardist in southern Indiana found the scale increasing in his or-

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# Apple Blotch and Its Treatment

By E. F. Guba

Massachusetts Agricultural College

THE DISEASE known as apple blotch was first reported on the leaves of wild crabapple trees near Crawfordsville, Ind., in 1892, by a botany professor of Wabash College who by chance collected diseased leaves on one of his field trips. In 1895, Waite, a fruit disease specialist in the employ of the United States Department of Agriculture, collected specimens of blotched apples in the vicinity of College Park, Md. He was unable to associate the disease with any known apple disease and consequently regarded it as a new disease. The early bulletins of the agricultural experiment stations in Missouri, Arkansas, Kansas and Illinois show that the disease existed in destructive form only in certain sections of these states as early as 1902. By 1905 the disease had appeared in Indiana, Tennessee, Kentucky, Louisiana, Mississippi and Texas. Up to 1910 the disease was reported in Ohio, Pennsylvania, New Jersey, the Virginias and to the south, and by 1915 in Nebraska, Iowa and South Dakota. By 1916 the disease had become established in the area including South Dakota, Nebraska, Kansas, Oklahoma, Texas, Louisiana, Mississippi, Georgia, Alabama, the Carolinas, Virginia, Maryland, Delaware, New Jersey, Pennsylvania, Ohio, Indiana and Illinois. In this area of states the disease is most

of the disease in New York state. The source of this stock was traced to the large nursery section in southern Iowa, where the disease is prevalent spread beyond its present range, indicated in Figure 1. For example, will the disease develop in the productive apple orchards of New York state,

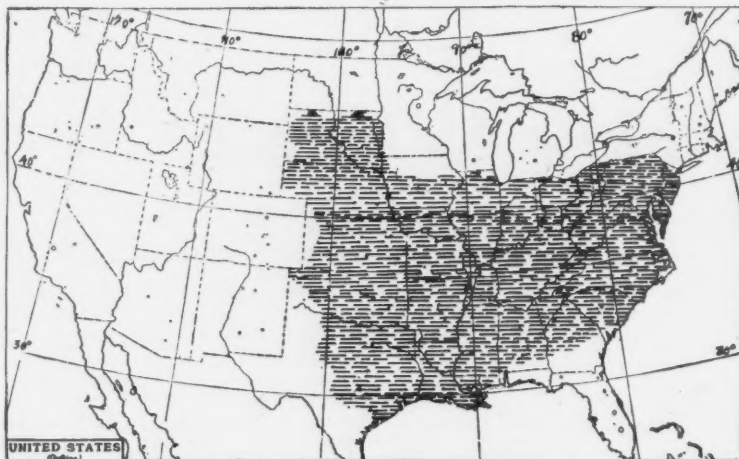


Figure 1.—The present distribution of apple blotch in the United States is indicated by the heavy lines

River since the beginning of our knowledge of the disease.

The fact that the disease may readily establish itself in the orchard through infected trees should encourage growers to examine their trees carefully as they are set out and to discard those which show any evidence of apple blotch cankers or other canker diseases. This method of preventing the introduction of the disease in the orchard is far more economical and practical than any method of attempting the eradication of the trouble after the trees have become established.

## Cause of Apple Blotch

Apple blotch is caused by the fungus *Phyllosticta solitaria* which produces small, pale, round spots on the leaves (Figure 2), tar spots or blotches on the fruit (Figure 3), and cankers on the bark (Figure 4). These signs of the disease are always accompanied by small black pimples, in which the seeds or spores of the fungus are produced. When discharged, the spores spread the disease in the orchard. The cankers persist in the bark indefinitely, although on some varieties and under some conditions they are forced off by the growth of the twig after three to four years. The cankers are the hibernating centers of the fungus and all of the spores or seeds responsible for the primary infection of the

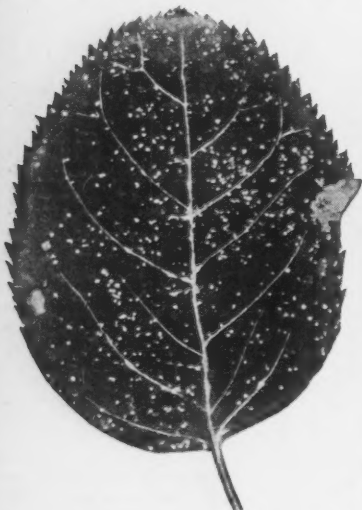


Figure 2.—Spots on an apple leaf caused by the blotch fungus

destructive to certain varieties of apples, such as Northwestern Greening, Ben Davis, Smith Cider, Duchess, Benoni, Missouri Pippin and Mann.

## Origin of the Disease

Our knowledge of the history of the disease in the United States indicates that the fungus was originally confined to wild crabapples, and that it spread from these native hosts to the commercial apple. This view is accepted because the fungus still exists on wild crabapples. The original occurrence of the disease on the commercial apple in destructive form in the Ozark region may be attributed to the presence there of diseased wild crabs, to extensive plantings of susceptible commercial varieties of apples, and to weather conditions favorable for the spread and development of the fungus. With the appearance of the disease in the nurseries, the fungus was spread to other states on nursery stock and apple seedlings.

## Spread of the Disease on Nursery Stock

Several instances are on record which show that the spread of the disease has been accomplished by shipments of diseased nursery stock. Only recently, Thomas, a plant disease specialist of New York state, found a planting of young nursery stock at Williamson, N. Y., infected with apple blotch. About 40 to 50 per cent of the trees were badly cankered. This is the first reported occurrence

and destructive to several varieties of apples. McClintock, plant pathologist in Tennessee, has given some attention to the study of blotch in nurseries. In a letter to the writer he states, "While I have not been able to visit all of the nurseries in this state, or to see shipments of each lot of trees which have come into the state, I have seen sufficient material to make me suspect that blotch is rather general on seedlings coming into Tennessee from the Middle West." Adams, plant pathologist in Pennsylvania, reported in 1916 that apple blotch has been found in Pennsylvania on nursery stock from the Middle West. Similar reports of the introduction of the fungus on nursery stock into new areas may be obtained from records from some of the other states in which the disease now occurs.

A question in which some fruit growers are vitally interested is whether or not the fungus is likely to

Michigan, the Northwest, Colorado, or any other large fruit area outside the present range of the disease? The answer is, "No," fortunately for the apple growers of these states. The reason for this is that the weather conditions in the states outside of the present confines of the disease are not favorable for the spread and development of the fungus. The fungus causing blotch, like the bitter rot fungus, is best adapted to the warmer climate of the southern apple belt. Here moisture and temperature conditions are ideal for the development of the fungus, and under such conditions it causes heavy losses. Since 1916 the range of the fungus in the United States has remained about the same. No new fruit areas have been invaded. If weather conditions in these areas were favorable, the fungus no doubt would have established itself there long ago, for diseased trees have been shipped quite freely over the states from nurseries west of the Mississippi



Figure 4.—Blotch cankers on apple twigs

fruit and leaves have their source in these cankers. These spores usually begin to be liberated from two to three weeks after blossoms fall.

## When to Spray for Blotch

Keeping the above facts in mind, the first protective cover spray for blotch must be applied between 10 days and two weeks after petal fall to prevent primary infection of the fruit and leaves. Since spores are liberated from the cankers in wet periods continuously during the season, frequent cover sprays must be applied to keep the fruit protected. These later sprays should be applied three weeks, four weeks, six weeks, and 10 weeks after the drop of the petals. The last treatment for blotch, that is, at 10 weeks after petal fall, should be timed to meet the emergence of the second brood codling moth.

## Materials to Use

Commercial lime-sulphur, one gallon of the concentrate to 40 of water, and Bordeaux mixture 3-4-50, are both effective in the control of apple blotch, but the choice of either depends upon the weather and the season. The moist cool weather of the spring months prohibits the use of Bordeaux mixture, while the warm dry weather of the summer months ordinarily prohibits the use of lime-sulphur. Control of the disease without russetting the fruit may easily be accomplished by employing lime-sulphur for the early applications and Bordeaux for the later applications.

(Concluded on page 51)

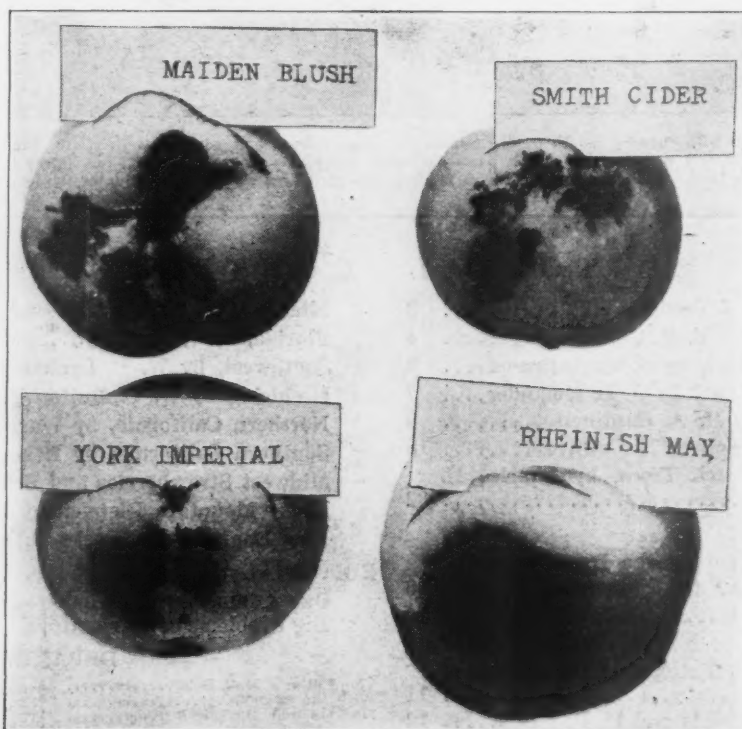


Figure 3.—Apple blotch no doubt got its name as a result of the blotchy patches it causes on the fruit



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# Recent Progress in Spray Equipment

By O. G. Anderson  
Purdue University

**R**APID strides have been made, in improving the production of spray equipment. The imperative need for greater man efficiency on the farm, and the keen competition from makers of all types of spraying and dusting appliances have stimulated the normal desire of the manufacturer to perfect his product. Contrast, for example, the daily output a few years ago of a man using one disk nozzle on the end of a rod, with that of the same man today using a gun. Less than five years ago outfits delivering 12 to 15 gallons of spray per minute at 300 pounds pressure were considered super machines, beyond the means of all but the biggest growers. Today a large percentage of sprayers in use are of this type.

This trend in construction has done away with much of the dissatisfaction with the gun which occurred in earlier years. Most growers today know that a gun of good capacity is too much for a one and one-half horse power sprayer. Furthermore, the average three and one-half horse power outfit isn't intended for two guns. Of course, it may supply them in passable fashion for a while, but wear soon reduces pump delivery and pressure, and speeding up the machine to overcome it shortens its usefulness. Many have learned that in every day performance they should figure pump delivery at from 15 to 30 per cent below the catalog rating.

The uses of the gun itself are much better understood today. Out of the seven or eight sizes of disk openings for guns now available, the majority of growers choose the one-eighth and nine sixtieths-inch sizes, delivering from five and three-fourths to six and one-half gallons per minute. With pressures over 300 pounds, the amount of liquid discharged through these openings is increased. On the heavy duty sprayers of 25 to 30-gallon capacity, operated at 400 to 500 pounds pressure, larger disk openings are being used with good results. And when the dormant spray is miscible oil, a one-sixteenth or three-thirty-seconds-inch disk opening is economical and satisfactory with trees not more than 15 feet in height. Tests have shown that guns with disks of standard size spray effectively to a height of 22 feet, and that disk nozzles on bamboo rods are equally effective. Establishing the height limitations for the gun has won many friends for it. Most everyone at first believed that a gun would cover any apple tree from the ground, but now the spraying of tops is done from the tank or from a tower.

A gun with its nozzle angled at 45 degrees, having a light, long barrel, is a mark of progress in gun construction. Such a design, embodying all the advantages of control and distribution now found in the best guns, will doubtless be popular in the future. Spraying low hanging limbs makes one wonder why the longer barrel and the angled nozzle have not been more generally adopted. Both features represent a real mark of progress in the efficiency of the small disk nozzle of earlier days.

A considerable group of growers still cling to the bamboo rod, using two angled nozzles of the small capacity disk type. A few use disk nozzles intermediate in capacity between the gun and the small nozzle. They like the reach of the bamboo rod, the angled feature of these nozzles, and believe they can spray more thoroughly with them. Yet skillful operators have produced crops practically as clean with the gun. Authentic reports show that 2000 gallons have

been applied in a 10-hour day from one gun and one outfit. While this is not every day performance, it is quite an advance over eight tanks (1600 gallons) for two men, which still represents good average performance with rods and medium-sized machines. Rarely do we find rods used on the larger machines of today.

## The Heavy Duty Sprayer

The term "heavy duty" as applied to sprayers practically means a type of machine delivering great volume and high pressure. With a gradual increase in the use of the gun, there was a corresponding increase in the horse power of engines. The standard three horse power machine of a few years ago was increased to six, then to eight, 10 and 15 horse power. At

greater accessibility to parts, better oiling systems, more durable working parts, dust and dirt exclusion, better automatic control, and comparative lightness of construction.

The question is frequently asked, "Haven't we reached the limit in pressure?" The same question was raised when 350 pounds was the limit. Manufacturers can build sprayers which will safely deliver more spray material at higher pressures, but probably not without increasing the price of the machine. It then becomes a question of how much a grower can afford to pay for a machine which increases the efficiency of his men. And this depends largely on the size of his business. The usefulness of the heavy duty sprayer is not confined to the portable outfit. It is supplementing

tional advantage of not disturbing irrigation ditches. In any region late sprays may be applied more easily where heavy loads of fruit have spread the trees until the spaces between rows have been closed. The grower need not worry about soft, wet ground miring his spray outfit or that heavy sprayers will pack the clay-like soil he may have in his sod orchard. Perhaps the most convincing advantage is that the labor required is only one-half or one-third of the amount required with a portable outfit. It does away with a team and driver. In orchards of 10 acres or less, one man may do the spraying and tend the machinery. Also the cost of gasoline or electric power is but little more than on the portable sprayer, and because there is no jolting or racking of machinery, breakage and repairs are less.

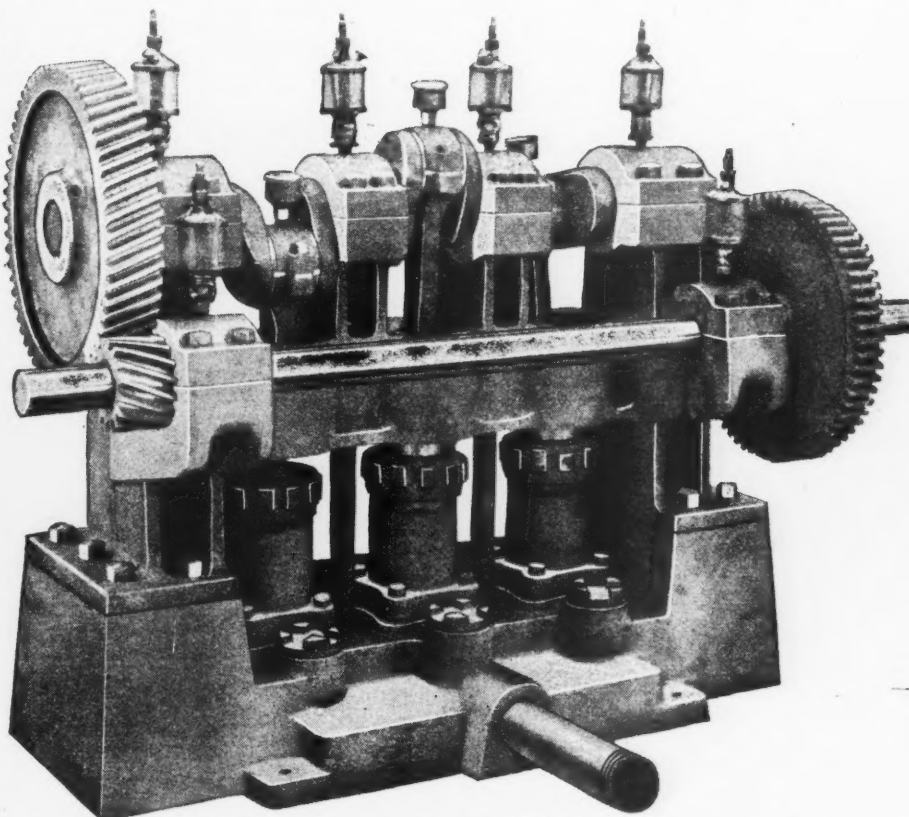
While these advantages indicate that stationary spraying may be a very efficient, up-to-date method, yet

it might easily prove to be a failure if careful attention is not given to installation. The central plant should be equipped with a tank for spray materials which is not too large for the capacity of the pump and the size of the orchard. For instance, tanks of 1000 gallons capacity are available but this capacity may be out of proportion to the capacity of pumps and engine for a small orchard. When lime-sulphur, lead arsenate, and some other spray materials are mixed at the rate of 1000 gallons at a time and then applied slowly, there is danger of chemical reaction and foliage injury. It would seem better to have two tanks each of smaller capacity; one tank could then be made ready while the other is being sprayed out, thus keeping the outfit in continuous operation and cutting down on time required to complete the job.

Where one or more guns will be used with this system, main line pipes should be not less than one inch in diameter and laterals not less than three-fourths. The pump should maintain 300 pounds pressure and deliver at least seven gallons per minute for each lead of hose to be used. In some instances, the size of pump used is the same as is to be found on portable sprayers of moderate capacity; in fact, some have been transferred directly

from the spray rig. The range of power for these systems varies from a three horse power electric motor to 20 or 25 horse power gasoline engines, and pumps vary accordingly. Allowance should be made in power and pump capacity for the frictional loss in pressure occurring in pipe lines. Where there are sags or bends in the pipe, there is sometimes as much as 75 to 100 pounds pressure loss in 800 to 1000 feet of pipe. Careful construction eliminates most of this and reduces the short bends and elbows. The loss of pressure between pump and nozzle varies with the square of the relative velocity of the liquid through the pipe line. It varies also directly with the amount of frictional surface. These factors should be calculated, otherwise the pressure may not be adequate in the remote parts of the orchard.

The cost of installation of stationary plants varies from \$75 to \$175 per acre. Where only three or four sprays are applied in a season, this cost might be prohibitive. To offset this high initial cost, owners expect well constructed plants to last at least five years longer than portable outfits. Step ladders or picking ladders are being used in place of the tank platform. (Concluded on page 40)



A heavy duty type of spray pump capable of delivering 25 to 40 gallons of spray a minute

the present time, engines of 20 horse power are being used on a number of sprayers, and the pump capacity has likewise jumped from the nine-gallon standard of five years ago to a maximum of 25 to 30 gallons. Only growers with large acreages can afford these outfits at present.

Spray machines have always demanded higher standards of engineering than the production of engines and pumps for stationary purposes. Spray pumps must have working parts which are not eaten out by spray mixtures. They must also withstand high pressures, so the engineer must reject the cast iron used in well pumps for bronze or phosphor bronze having two or three times the tensile strength of cast iron. Greater strength is thus secured from the same amount of metal, and lightness of the outfit has been retained to a surprising degree while increasing its capacity. Try to imagine present day pressures applied to old style outfits, and visualize the accidents likely to happen. We can then better appreciate the engineering advances which make possible 400 to 500-pound pressures on heavy duty sprayers at the present time.

Among the improvements in present day sprayers are heavier reinforced steel beds, hardened steel gears,

the work of smaller machines in stationary spray systems.

## Stationary Spray Systems

Steep hillsides, irrigation ditches and a desire for a more economical and efficient system of spraying developed the stationary method. The stationary or pipe system of spraying is now past the experimental stage and is evidently here to stay as long as insecticides and fungicides are applied under pressure with water as a carrier.

A stationary system consists of a central pumping plant with a pipe system of main lines and laterals leading through the orchard. In the majority of cases these pipes are spaced sufficiently far apart so that a hundred foot hose when attached at regular intervals will thoroughly spray the trees between any two lines of pipe.

In hilly country, the first and most obvious advantage of the stationary system is the elimination of hauling extremely heavy spray outfits through the orchard. The majority of sprayers used in such regions will weigh when loaded from a ton and one-half to more than two tons.

In regions where irrigation is practiced, the pipe system has the addi-

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## Our Annual Spray Number

IT HAS been the policy of the American Fruit Grower Magazine for several years to devote the February issue to spraying and dusting and the treatment of insects and diseases. In keeping with this policy, this number is given over almost entirely to spraying and dusting calendars and to articles on the treatment of insects and diseases. The calendars present programs for spraying and dusting the leading fruits in all of the important producing sections of the country. The articles treat subjects of particular interest at this time along spraying lines.

The spray calendars have all been prepared for this particular issue, and they represent the very latest and best information, prepared by leading authorities, that is available on spraying and related subjects. In justice to the contributors, we believe it should be stated that in our opinion there is no better information in the country on spraying than is contained in this issue.

It has been our custom to have the same authorities, as far as possible, prepare the calendars from year to year. Some changes in personnel are necessary because of changes in positions, but in the main we have been able to follow this policy very closely. We believe that this policy insures subscribers a spraying service that would be impossible if changes in authors were made from year to year.

The February issues of past years have met with general approval. Growers from all over the country have been following the spray calendars and report satisfactory results from the same. Every year we receive requests from college and station men for extra copies to use in their classes. Some of our subscribers in foreign countries have obtained valuable help from the February issues in particular, as well as from other issues.

We hope this issue will please you, and we should appreciate it if you will let us know what you think of it.

## Produce Quality Fruit

MORE and more, as we study the marketing question, the conclusion is forced upon us that production and marketing go hand in hand in the development of efficient merchandising methods. The production of

the right kinds and varieties of fruit and of fruit of high quality are extremely important factors in solving marketing problems. Good fruit usually more than pays the cost of production, while poor fruit rarely does.

Good spraying is an important factor in quality production. Get ready to do a good job of it this year. Study the spray calendar in this issue for your section. Look over your equipment and make such repairs and replacements as are necessary for efficient and timely work. Study your trees and small fruit plants as the season progresses. Apply the right materials at the right times, and do the job thoroughly. Good quality fruit will follow.

## The Big Problem of Agriculture

FRUIT growers in general believe that they represent a higher type of agriculture than general farmers. They are probably right in this viewpoint, because it is a fact that successful fruit growing requires a more technical understanding and a keener appreciation of plant life than is required in general farming. The fruit grower, however, who separates himself entirely from other lines of agriculture is making a mistake. Fruit growing is part of agriculture as a whole, and the industry is governed from an economical standpoint by conditions that affect food production in general. When there is a large cereal crop, for instance, prices for fruits are lower, and vice versa. The wise fruit grower, therefore, will take an interest in agricultural conditions in general, as well as in fruit growing in particular.

The convention of the American Farm Bureau Federation at Chicago in December revived a number of questions which are attracting a lot of attention not only among farmers but among people in general. These questions may have considerable influence during the next few years from a political as well as an economical standpoint.

The President's speech disappointed most of the farmers in attendance at the convention. Some of the daily papers took the view that it was the President's remarks about the export corporation idea that displeased the farmer representatives, but many of those present believe that it was the President's viewpoint in regard to agricultural conditions in general that was most responsible for farmer dissatisfaction.

The former president of the A. F. B. F., O. E. Bradfute, was defeated, and Sam H. Thompson of Illinois was elected. Bradfute approved the President's speech, while Thompson disagreed with the viewpoint of the President. While Thompson held a strong bid for the presidency before the convention started, many people believe that the President's speech helped to crystallize the sentiment and to bring about the defeat of Bradfute and the election of Thompson.

Immediately after the convention some of the metropolitan papers pictured Sam Thompson as the leader of the radical element of the A. F. B. F. This was an altogether incorrect view. Fortunately, that viewpoint has apparently been abandoned by the metropolitan papers. Sam Thompson comes from a conservative community. He started as a poor boy, and by hard work and good sense he accumulated a 500-acre farm in a good farming section. In recent years he has been active in developing a bank in Quincy, Ill. While other banks in that vicinity, as well as elsewhere, have had hard sledding because of unwise investments and loans, Sam, as president, has led his bank through the post-war period with flying colors. The A. F. B. F. will be perfectly

safe in Sam's leadership, and farmers, business men and politicians will be convinced of this as soon as they become better acquainted with him.

The big question that the convention revived is that of the exportable surplus of staple food products and what to do with it. The export corporation idea was almost dead before the convention, and even farmers were badly split in regard to the matter. There is now a very decided interest in the question, and even such leaders as Frank Lowden, Vice-President Dawes, Senator Capper and Senator Cummings are taking an active interest in the matter. More important still, Secretary of Agriculture Jardine has recently announced that the department is studying the proposition and will hold conferences in an effort to develop a workable plan of handling the surplus problem,—this announcement indicates a change in attitude on the part of the administration.

The farm bureau leaders take the view that the exportable surpluses of wheat, corn, cotton, etc., set the domestic prices at world price figures in years when we have a surplus. This view seems reasonable. It is a matter of record that in years when there has been no surplus the domestic prices have been higher than the world market prices. Since we market a surplus almost every year, it follows logically that American farmers must compete with the farmers of the world with the products they sell. On the other hand, they must make many of their purchases in a market protected from the rest of the world by a high tariff. There is a rapidly growing sentiment among farmers that the tariff operates to the disadvantage of agriculture. It is true, of course, that some farm products are protected by a tariff, but in some cases at least the fact that we produce a surplus prevents these tariffs from operating to the advantage of agriculture.

Besides the tariff, there are other factors which are operating to the disadvantage of agriculture. Laws of various kinds, court decisions and the development of powerful corporations have all helped to bring about artificial conditions which favor certain groups at the expense of agriculture. There is a steadily growing sentiment, both among farmers and business men, that agriculture is not getting a just division of the national income.

The big question, of course, is, "What can be done about it?" From the standpoint of principle, there are only two ways of approaching the problem. One method would consist in withdrawing the advantages enjoyed by other favored groups so that all groups would be placed on an absolutely competitive basis. This method would seem to be the more American-like method and more in line with the principles of Washington and Jefferson, but it seems hopeless to bring about adoption of this method, for the tariff is virtually a tradition in this country, and there is little chance that the other advantages enjoyed by certain groups will ever be withdrawn.

The other method consists in favoring agriculture through legislation and otherwise so that food producers will enjoy advantages equal to those enjoyed by other groups of society. This method would have the same effect as the first, namely, that of placing all groups on an equality basis. Of course, in practice it will be impossible to ever reach a basis of absolute equality, for in our artificial system of society there will always be more or less inequality. But, as Frank Lowden says, "With all the brains that exist in this country, surely some method can be developed whereby agriculture can be placed on a basis of equality approximately equal to that enjoyed by other groups."

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# Are Insects Becoming More Resistant?

By A. L. Melander

Washington Agricultural Experiment Station

WHEN a conscientious fruit grower fails to control the pests of his orchard by spraying, he is inclined to blame the quality of his sprays. If he appeals to others, he is likely to be told that his application was faulty or his mixing of the spray was careless, but that is a poor consolation. If he is unsuccessful again the next year, he may wonder if it is not the insects that are developing a resistance to sprays and not that faulty material or poor spraying or weather conditions favorable for insect development or some other cause is responsible for his losses. Undoubtedly many, perhaps most, cases of failure to control insects are due to improper spraying practices, but here and there have been reported baffling cases of insect increase which can be understood only on the basis of a developing tolerance, or even a real resistance, to some sprays on the part of the insects.

## Improvements in Methods of Insect Control

With improvements in insect treatment being made yearly, many innovations have been held responsible for losses. The omission of salt from the old sulphur-salt-lime wash was long accused of lowering the effectiveness of this spray. Later, the reduction in the amount of lime was blamed. Then factory-made lime-sulphur had the prejudice to overcome that it was inferior to the freshly-made product. The displacement of paste arsenate of lead by powder required years because of the belief that the powder form was less efficient, and even to-day many orchard men think that the general prevalence of the codling moth is due to the wide-spread adoption of powdered lead arsenate. The change from potassium to sodium cyanide was held responsible when fumigation did not produce expected results. The advent of the spray gun has repeatedly been blamed for ineffective control of insects, as has other labor saving devices, like high pressure and stationary spray plants.

When the accusations against sprays and spraying become acrimonious, the state entomologist shows that the chemical analysis of the new spray materials guarantees them up to standard, and the county agricultural agent holds a spraying demonstration and shows that the spray gun operated under high pressure from a stationary spray plant is an ideal modern achievement. The theory is then discussed as to whether or not insects can get used to spray poisons, and while the theory is usually pooh-hoed, the supporters of the idea have the objectors scratching their heads in doubt.

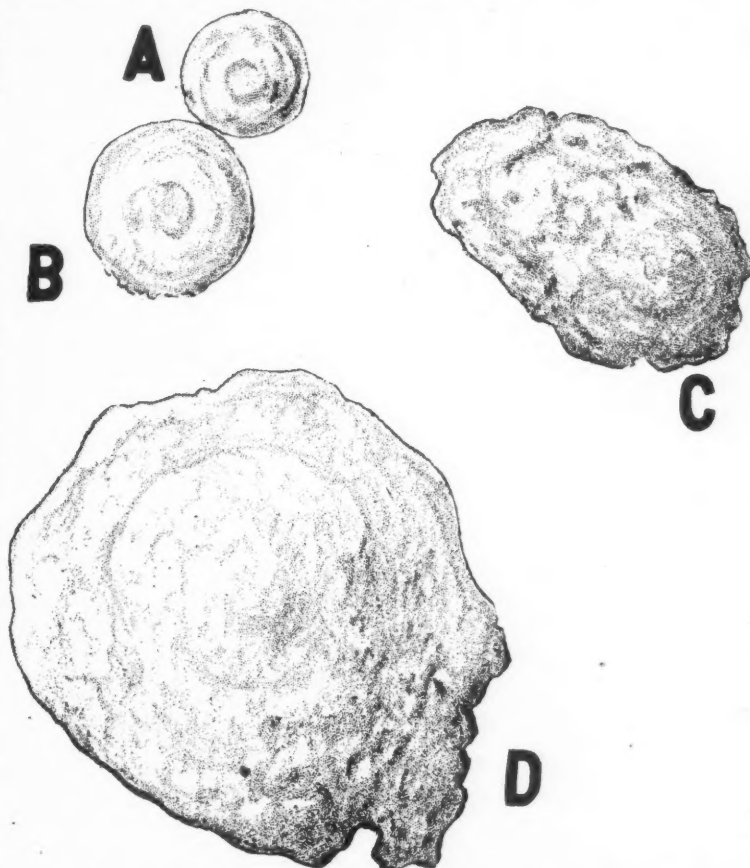
## Spraying Kills the Most Resistant Strains

It sounds plausible, and is apparently supported by the experiences of many persons, that insects can get used to poisons in time. Spraying is done in a wholesale manner, reaching whole populations of insects and subjecting them all to new but similar conditions. Time and again some certain individuals that have been subjected to just as much poison as their neighbors live on, apparently because they were physically strong enough to resist the poison. That insect control is rarely 100 per cent perfect is the experience of all. No matter how strong arsenate of lead is applied for codling moth or how often the application is repeated, some worms penetrate into the fruit. No matter if their backs are white with encrusted lime-sulphur, some San Jose scales do not forthwith perish, but live on to a ripe old age. No matter if fumigation is repeated at double strength, some citrus scales bid defiance to the orchardist and refuse to die in regular manner.

On the principle of the "survival of the fittest," such sturdy specimens as are able to outlive the others tend to pass on to their descendants their tol-

erance to poison. Spraying thus repeatedly eliminates the weaklings, until sooner or later a resistant strain is produced. Fortunately, there is not much chance that this will happen, because sprays are used strong enough to kill all, or almost all, but we must not forget that millions of millions of insects are annually subjected to the action of sprays, and if a hardy race once starts, our methods of insect control will tend to establish it as a pure-breeding vigorous race by weeding out

writer, it was found that surprisingly weak dosages of arsenicals would kill the insects. When the spray was used much below the usual strength, the caterpillars that were not killed outright were affected by the poison so that they stopped feeding and after a while died of starvation. In these experiments only a few thousand insects were tested, so the results do not enable us to say that never out of doors could insects acquire a resistance to arsenical sprays. They indi-



San Jose scales from Clarkston, Wash., sprayed with double-strength lime-sulphur. Drawn from enlarged photograph made two months after spraying. A.—Susceptible to spray, dying directly after spraying. B.—Partially tolerant, resuming growth after spraying but soon dying. C.—Resistant male, reaching full growth, the winged insect already emerged. D.—Resistant female, fully grown and unharmed by the spray treatment

year after year all that are susceptible to poisons.

## Immunity to Poisons Developed by Many Animals

There are plenty of cases known where animals can live under conditions ordinarily thought fatal. Some insects live in hot springs. Some maggot breed in strong brine wells, in alkaline lakes, or even in crude petroleum. The arsenic-eating people of Europe gradually accustom their bodies to small amounts of poison until they are able to take more than an ordinarily fatal dose. We hear of dope fiends who develop a resistance to poisons and crave them. If spraying were imperfectly done, it is conceivable that leaf-eating insects might get small dosages of arsenic, not enough to kill them, but enough to raise their immunity to poison. The question then arises, could they pass on such acquired immunity to their offspring; and while we have no reliable answer, it is not considered impossible that such immunized individuals might transmit through their eggs enough protection to start the next generation on an arsenic-eating career.

In some experiments with gypsy moth caterpillars, conducted by Prof. Brues of Harvard University and the

cate, however, that it is not likely to be expected.

## Subject Is Still in Theoretical Stages

The question arises as to whether immune strains will arise in all species of insects through the long-continued use of sprays. Fortunately, the evidence so far indicates that this is not the case. It is doubtful if caterpillars, grasshoppers, cotton weevils, and the like, are all developing a resistance to stomach poisons throughout the country. The action of arsenic sprays is too drastic to expect that. So far, it is a theory only, that future insects may become harder to kill. If the codling moth is increasing in some locality, it is most likely due to ineffectiveness in application of spray rather than to a new resistance to arsenic. In the case of scale insects, however, there is some evidence which indicates that already in several restricted localities contact insecticides are failing to destroy all individuals.

## Experience with San Jose Scale

At Clarkston, Wash., there is a local strain of San Jose scale which the writer has kept under observation for many years. Twenty years ago the scale there was apparently as easy to control with lime-sulphur as elsewhere.

Then fruit growers at Clarkston noticed that their spraying did not check the scale, and ever since that time experimental spraying at Clarkston has failed to kill all scales, even when the spray has been used excessively strong. This strain of scale that shows such remarkable resistance to lime-sulphur is easily destroyed by oil spray, so it possesses a specific tolerance to sulphur-containing sprays only.

Whenever and wherever scales are sprayed with lime-sulphur and the rate of kill is carefully noted, it is found that some die sooner than others, but that after two or three weeks all, or nearly all, have succumbed. At Clarkston the effect of the lime-sulphur spraying is usually scarcely noticeable in two weeks, and the scales then die more slowly than usual, some living and growing under conditions that ordinarily are fatal.

## Strength of Lime-Sulphur Makes No Difference

The strength of the lime-sulphur spray has little to do with the rate of kill and also with the total number of scales that die. If lime-sulphur is efficient, as in the Wenatchee district, it kills whether weak or strong. If it is not efficient, as at Clarkston, it does little good to increase the strength of the spray, because a strong spray does not affect the most resistant individuals, though it does destroy those that are only partially tolerant.

Repeating the application is no more helpful, because those individuals that survive the first spraying live through the second as well. We have transferred Clarkston scales to Wenatchee and sprayed them alongside of Wenatchee scales and have found the Clarkston scales harder to kill; we have also transferred Wenatchee scales to Clarkston and found that they are still completely susceptible to lime-sulphur treatment which the Clarkston scales, sprayed at the same time, are able to withstand. The only explanation that fits the facts of the case is that the Clarkston strain contains an unusually large number of individuals partly or wholly resistant to sulphur-containing sprays.

## Citrus Scale Resists Fumigation

There are two districts in California that have been reported by Professors Quayle and Woglum as having produced citrus scales that withstand orchard fumigation. Previous to 10 or 15 years ago, the red scale and the black scale in these districts were easily controlled by the customary 75 per cent dosage fumigation with cyanide gas. In the meantime, as resistance has become more manifest, the strength of fumigation has been increased, until some orchards now receive a double treatment on a 150 per cent schedule, and still the scale is not eradicated. That these scales are definite local resistant strains has been proved by fumigating, under one cover, boxes of infested lemons brought together from various districts. The localities where field observations indicated resistant races furnished scales which outlived the others, even under double-strength treatment.

## Change in Spray Materials May Handle Situation

The idea that strains of insects can be bred to elude the action of sprays holds a sort of pessimism. If this comes to pass, economic entomologists will have to develop their science from a new angle so as to keep ahead of the changing pests. Already, where insect control is becoming more and more difficult, a change in treatment is in progress. At first sprays are used stronger and the number of applications is increased. When this fails or becomes too costly or even dangerous to the trees, new methods are sought. Oil sprays are displacing lime-sulphur through southern Illinois, where scale insects are reported as becoming harder to control, as well as

(Concluded on page 40)

# Spray Calendar: Shenandoah—Cumberland Region

Prepared by the Departments of Horticulture, Plant Pathology and Entomology  
Virginia Polytechnic Institute, F. A. Motz, Extension Horticulturist

## APPLES

### DISCUSSION OF SPRAY CALENDAR FOR APPLES

Since apple growing is the most important branch of the Virginia fruit industry, the apple spray calendar is of the most importance. The Virginia Spray Service applies only to the apple calendar, therefore every apple grower should familiarize himself with the name, the number and materials used for every spray, and the specific diseases and insect pests to be controlled.

The following discussion is presented for the purpose of informing the growers of the materials used, the purpose of each spray and the factors governing the timing of these sprays.

**Spray No. 1 (Delayed Dormant)**—This spray should be applied in every orchard. Application should be most thorough in order to destroy every aphid egg or aphid and scale on the tree. The eggs are usually found under the edge of loose bark or in depressions in the bud where they are protected. Unless they are actually covered by the spray material they will not be killed. Whenever scale is found under the large pieces of bark on the trunk of a tree, this bark should be removed before spraying.

**Sprays Nos. 2 and 3 (Pink and Calyx)**—The pink and calyx sprays are the most important sprays for scab, leaf spot and codling moth. The calyx spray is the most important single spray in the apple spray calendar because it is an important scab spray and the most

important codling moth spray. Both the pink and the calyx sprays are absolutely essential for scab control because they are applied when the first infections occur.

**Spray No. 4 (Ten-day)**—It is definitely known that this spray cannot be omitted on scabby varieties and those susceptible to leaf spot (frog-eye). This spray may be omitted on non-scabby varieties like York Imperial and Grimes where leaf spot has not been prevalent in previous years.

**Spray No. 5 (Five-week)**—This spray must be applied in every orchard as specified in the calendar because it is primarily a codling moth spray, and this insect attacks every variety.

**Spray No. 6 (Seven-week)**—Where bitter rot and cloud are prevalent, this spray is of great importance. In orchards free from bitter rot, this spray may be omitted but it should always be applied to Pippins.

**Spray No. 7 (Mid-summer)**—This spray must be applied in every orchard as recommended in the calendar. In the Winchester section an additional spray is necessary in August to control the leaf roller. The time for applying this spray will be given by the spray service. The leaf roller is very difficult to control because of its habits. It is necessary to apply a lead arsenate spray made of 6 lbs. of lead for each 100 gals. of water to which 20 lbs. of slaked stone lime is added.

No. and Name of Spray.	Parasites.	Time of Application.	Materials to Use Per 100 Gals.	Remarks.
(1) Delayed dormant.	Scales, aphids.	When green can first be seen in tips of blossom buds.	Lime-sulphur (32 degrees Baume), 12 gals.; nicotine, ½ pt. (Oils may be used for scales.)	If the orchard is badly infested with scale, one application of one of the oil sprays should be made in February or early March; then apply the delayed dormant spray at the regular time, using lime-sulphur and nicotine.
(2) Pink spray.	Scab, mildew, frog-eye, curculio, bud moth.	When majority of blossom clusters are separated.	Lime-sulphur (32 degrees Baume), 10 qts.; lead arsenate, 3 lbs.	Spray all varieties except York and Grimes, and these varieties also if they were infected with scab or mildew the preceding year.
(3) Petal-fall spray.	Scab, mildew, frog-eye, codling moth, curculio, leaf-roller and other chewing insects (red bug).	When most of the petals have fallen.	Lime-sulphur (32 degrees Baume), 10 qts.; lead arsenate, 3 lbs.	This spray is very important in the control of codling moth and scab.
(4) Ten-days spray.	Scab, frog-eye, mildew, curculio, codling moth (leaf-roller).	10 days after petal fall stage.	Lime-sulphur (32 degrees Baume), 10 qts.; lead arsenate, 3 lbs. (Lead arsenate not recommended in Virginia except for leaf-roller.) Nicotine, 1 pt., necessary in Pennsylvania for red bug.	The most effective frog-eye spray and important for scab control. If these diseases are not prevalent on York and Grimes, the spray may be omitted on these varieties.
(5) Five-weeks spray.	Codling moth and other chewing insects, blotch.	About 6 weeks after petal fall stage as determined by the spray service.	Lead arsenate, 3 lbs.; lime-sulphur (32 degrees Baume), 10 qts., or Bordeaux mixture as advised by spray service.	This is applied when first brood codling moth larvae are hatching. Without it, neither codling moth nor bitter rot can be controlled.
(6) Seven-weeks spray.	Bitter and black rots, cloud and blotch.	7 weeks after the calyx spray.	Bordeaux mixture, 4-5-50 formula.	Apply in Pippin and other rot susceptible orchards; also wherever rot, cloud or blotch was prevalent the preceding season.
(7) Mid-summer spray.	Codling moth and other chewing insects, bitter rot, blotch.	About 10 weeks after petal fall as determined by the spray service.	Lead arsenate, 3 lbs. Lime-sulphur or Bordeaux mixture as advised by the spray service.	This spray is recommended just before the period when the codling moth larvae of the second brood hatch in greatest numbers. Also necessary for leaf-roller control.

**Footnote 1**—Experiments indicate that lubricating oil emulsion will not control apple aphids in the cracked egg stage. If treatment is delayed until eggs are hatched, the oil emulsion, combined with nicotine, is effective. However, lime-sulphur applied during the cracked egg stage is very effective in destroying the eggs prior to hatching, but after the eggs have hatched, lime-sulphur will not give control; nicotine must be added to it at this stage. The date of the cracked egg stage of the aphids eggs will be sent to the growers through the spray service. The cracked egg stage usually lasts over a 2 weeks' period.

**Spray Service**—Information as to actual time of application of sprays Nos. 5 and 7 will

be sent to Virginia growers through the spray service channels. This information will be secured by field entomologists and will be disseminated through the office of the county agents or through the office of local fruit growers' organizations. In addition, attention will be called to the other sprays prior to time of application.

**Footnote 2**—In this calendar, the recommendations for the use of lime-sulphur solution are all based on a solution testing 32 degrees Baume. It is suggested that the strength of lime-sulphur be tested both in the concentrated and dilute forms. This will guard against mistakes and may prevent loss from insufficient strength or from burning.

## PEACHES

No. and Time of Application.	Materials to Use.	Parasites.
(1) Dormant season (before buds have commenced to swell), February or early March.	Standard strength concentrated lime-sulphur, diluted 1 to 8.	Scale, leaf curl.
(2) Immediately after the petals drop.	1 lb. powdered lead arsenate to 50 gals. water; add 3 lbs. freshly slaked lime to each 50 gals. of solution.	Curculio.
(3) One week after No. 2.	1 lb. powdered lead arsenate to 50 gals. water; add 3 lbs. freshly slaked lime to each 50 gals. of solution.	Curculio.
(4) Three weeks after No. 3.	Self-boiled lime and sulphur or dry mix. Add 1 lb. powdered lead arsenate to each 50 gals. of solution.	Curculio, scab.
(5) One month before fruit ripens.	Self-boiled lime and sulphur or dry mix.	Scab, brown rot.
(6) For late varieties only; 3 weeks after No. 5.	Same as in No. 5.	Brown rot.

In the northern part of Virginia and in orchards which are damaged from early infection of brown rot, resulting in blighting of the blossoms and drying up and dropping of the small fruit, apply same materials as in spray No. 4 when pink begins to show in the bud. Early infection of brown rot is not prevalent generally over the state, but it occurs in parts of northern Virginia, particularly in Loudoun county. Unless blossom blight has been prevalent, follow the schedule as recommended in calendar above. No. 1 must be applied while the trees are absolutely dormant and before the bud scales begin to separate, if leaf curl is to be controlled, and the pink spray must go on before the petal spray.

If rose chafer should become serious, spray with arsenate of lead, 4 lbs. to 50 gals., to which 1 gal. of molasses is added. Application should be made when the bugs appear. Caution—This spray should not be used unless absolutely necessary, as severe burning may follow.

## CHERRIES

No. and Time of Application.	Materials to Use.	Parasites.
(1) Dormant season.	Lime-sulphur, standard strength, diluted 1 to 8.	Scale.
(2) Immediately after petals fall.	Standard strength lime-sulphur. Sour cherry, diluted 6 qts. to 50 gals. Sweet cherry, diluted 5 qts. to 50 gals. Add 1 lb. lead arsenate to each 50 gals. of solution.	Leaf spot, curculio.
(3) One week after No. 2.	Same as in No. 2.	Leaf spot, curculio.
(4) Three weeks after No. 3.	Same as in No. 2.	Leaf spot, curculio, brown rot.
(5) Immediately after fruit is harvested.	Same as in No. 2 but omit the lead arsenate.	Leaf spot.

If rose bug should become serious, apply same treatment as recommended for peaches.

## PLUMS

No. and Time of Application.	Materials to Use.	Parasites.
(1) Dormant season.	Standard strength lime-sulphur, diluted 1 to 8.	Scale and general clean-up.
(2) As soon as petals fall.	Standard strength lime-sulphur, 6 qts. to 50 gals. water; add 1 lb. powdered lead arsenate to each 50 gals. solution.	Curculio, leaf spot.
(3) One week after No. 2.	Same as in No. 2.	Curculio, leaf spot.
(4) Three weeks after No. 3.	Same as in No. 2.	Curculio, leaf spot.
(5) One month before fruit ripens.	Self-boiled lime and sulphur.	Brown rot and other fungous diseases.

## GRAPES

No. and Time of Application.	Materials to Use.	Pest.
(1) Dormant season.	Lime-sulphur, 32 degrees strength, diluted 1 to 8.	Scale and general clean-up.
(2) When second or third leaf shows.	Bordeaux, 4-5-50.	Anthraxose, bitter rot, black rot, mildew.
(3) Before blossoms open.	Bordeaux, 4-5-50.	Anthraxose, bitter rot, black rot, mildew.
(4) After blossoms fall.	Bordeaux, 4-5-50.	Anthraxose, bitter rot, black rot, mildew.
(5) Ten to 14 days later.	Bordeaux, 4-5-50.	Anthraxose, bitter rot, black rot, mildew.
Then after at 2-week intervals until within 2 weeks of harvest time.	Bordeaux, 4-5-50.	Anthraxose, bitter rot, black rot, mildew.

Lead arsenate, 2 lbs. powder to each 50 gals. of solution, should be combined with Bordeaux if chewing insects make an appearance.

Burgundy mixture may be substituted for Bordeaux in the last spray in order to prevent discoloring of the fruit. The following formula is suggested:

Caustic soda ..... 5 lbs.  
Copper sulphate ..... 4 lbs.  
Water ..... 50 gals.

Prepare and apply same as Bordeaux.

## RASPBERRIES AND BLACKBERRIES

Anthraxose causes cankers on the canes of the raspberry and blackberry. It is the most important disease of the bush fruits in Virginia and can be effectively controlled by the application of two lime and sulphur sprays according to the following calendar. The addition of a casein spreader at the rate of ½ lb. to 50 gals. of spray material is necessary to secure control.

No. and Time of Application.	Materials to Use.	Pest.
(1) In spring just after growth begins.	½ gal. commercial lime-sulphur in 50 gals. water.	Anthraxose.
(2) One week before bloom.	1 gal. commercial lime-sulphur in 50 gals. water.	Anthraxose.

\*Spray No. 1 should be applied after growth begins but not after the leaves have reached ½ in. in length.

## STRAWBERRIES

No. and Time of Application.	Materials to Use.	Pest.
(1) When growth begins.	Bordeaux mixture, 4-5-50 formula.	Leaf spot.
(2) Before blossoming.	Bordeaux mixture, 4-5-50 formula.	Leaf spot.
(3) Just after blossoming.	Bordeaux mixture, 4-5-50 formula.	Leaf spot.
(4) After leaves have been mowed and burned.	Bordeaux mixture plus 1 lb. lead arsenate to each 50 gals. Bordeaux.	Leaf spot, flea beetle.

Should leaf roller appear, or if it has been prevalent, add lead arsenate at rate recommended in No. 4 spray in each application.



# Fire Blight Can Be Controlled

By H. A. Cardinell

Michigan State College

**C**AN FIRE BLIGHT be controlled in any orchard, anywhere? Yes! and without reservations. Such a question will appear ridiculous to deciduous fruit growers of the Pacific Northwest states, where economic control has been a reality for 20 years. However, to fruit growers of the Central West and East, this question will appear neither amusing nor out of place. The only point that may resemble a "joker" is, "What constitutes control?" Well, let us clear that point and then tell how to obtain it.

## Blight Control Defined

By control is meant commercial control, not necessarily complete and permanent eradication of this disease

remedy that experience shows really yields good results and is practicable.

## Other Methods Have Been Tried and Found Wanting

Many ideas have been put forth in every fruit region as to a good manner of "handling blight." Most of these have resulted from faulty judgment or short time observation. The most popular opinion is that if blight is left alone (especially in the case of apple trees over 20 years of age) it will die out in the "long run;" but the

blossom infection can cause a "blight run" that may reach the base of good sized limbs or even involve the trunk bark. These may terminate in the form of live, over-wintering cankers.

3. *Crown and root blight* has often gone unrecognized, and this may have been the reason that many attempts at control have not been rewarded with a marked reduction in blight during the years immediately following the control work.

## Every Step in Practical Control

Whether the job is to locate the first few cases that have just appeared in an orchard and treat them or to clean up a severe or widespread infection of long accumulation, the procedure is essentially the same, though naturally there will be some difference in the relative importance of the different steps. The mode of attack in a fight against blight may be outlined as follows:

A. During early fall, beginning on the side of the orchard where blight is most plentiful, systematically examine every tree for blight. Do not merely walk around each tree; go over every scaffold limb, being certain to examine each one from base to tip. Look particularly for blight cankers on the lower side of limbs. Before going to the next tree, every blighted twig, spur, sprout and blight canker should be removed. Remember, the amount of infection each infected tree may have the next season depends largely on the degree of thoroughness in removing diseased tissue during the dormant season.

B. If advance labor has not already removed surface soil so as to expose the base of the upper roots for examination, this should be done to every tree before passing on to the next. If so much diseased or dead bark is found that its removal will partially or totally girdle the tree, mark the tree with a band of paint on the trunk, replace the earth for winter protection, and postpone the underground work until early spring.

C. In localities where the ground freezes, it would not be well to disturb the soil until spring, except for

Wherever diseased bark is encountered it should be sliced away until healthy tissue of normal color is reached.

A methodic search for trouble below the surface of the soil will often reveal a most startling condition in many orchards. Recent mouse injury, winter injury and that class of injury often listed as "man blight" will be brought to light, repaired and many a tree saved or its productive life extended.

D. After the orchard has been thoroughly worked over, it is always advisable to combine the next procedure with a careful check to see that no blighted tissue remains.

As often as good weather will permit, all large wounds on main limbs, trunk and roots should receive a coat of a good wood-preserving compound. For this purpose there is much merit in the government formula of high grade coal tar (not gas tar) thinned to a brushing consistency with a good grade of creosote oil (not crude carbolic acid or cresol dips or low grade creosote oils known to the trade as "dead oil"). A material rather new to horticulture is Barrett and Company's "Plastic Elastigum," with which we have been experimenting for two years. To the writer it appears especially promising for root and crown work, for it has the remarkable property of adhering as readily to a wet surface as it will to one absolutely dry. It may be thinned with creosote oil.

Nearly all wood preserving compounds will injure cambium. If the freshly cut bark hasn't been protected with brush grafting wax or high grade shellac, it will pay to use care and a small brush and avoid letting the caustic paint cover the cambium.

The covering should be allowed to set and dry before grafting is attempted or the soil replaced.

## Putting Back the Hide

E. The final step in the repair work is to "put back the hide." Two forms of grafting are usually required:

1. The *bridge graft*, using scions of suitable length, is commonly employed. This type is possible if there is live, healthy bark immediately above and below the injury. For crown and root cases, bridging is very



Left.—In this case the blight traveled up the trunk and down the root bark. Right.—In four months after treatment this tree was entirely supported by seedlings and bridge grafts. It is good practice to anchor weak trees to stakes until the seedlings are well rooted

from an orchard or an entire district. Economic control of fire blight in an individual apple, pear or quince orchard can be accomplished by any thorough-going orchard operator. Most growers are satisfied to obtain what is termed commercial control of scab, aphids, psylla or anthracnose. Similarly, they should be gratified if, by methods equivalent to those outlined in this article, they can obtain equally good control of fire blight, at an average cost far below that of spraying in an attempt to control these pests.

It is surely as sensible to control blight as it is to plan an annual attack for scab or codling moth. Yet how few are the growers who do so! Many pests injure but one season's crop, while bacterial blight may cost the growth of several seasons. In addition, during years of relatively inactive periods blight hovers over the orchard awaiting favorable conditions for another outbreak. As a matter of fact, where blight is a limiting factor in production, should it not be given as much thought and time as is accorded spraying, pruning or applications of fertilizer?

## Blight Control Methods Are Not New

The modern method of blight control employs fundamentally the same technique as was in use over 40 years ago. It is essentially the method employed by Dr. M. B. Waite and his associate, Scott, who were sent to California by the federal government to direct and instruct in blight control during the epidemic years of 1905, 1906 and 1907, in co-operation with the officials of that state. In brief, it consists in the removal of the over-wintering cankers caused by the disease. Incidentally, it may be added that it is not only the standard practice of today, but is the only known

individual fruit grower does not live "in the long run." He should know how to prevent it the next test year.

Growers often cut out infected parts after the infection has run its course for the season. This is the summer removal system so popular, yet so ineffective, which unfortunately has been rather generally recommended. The wisdom and practicability of this procedure is more or less comparable to locking the barn after the mare has been stolen. It removes the result more often than the cause and in practice often spreads as much of the disease as it removes. Anyhow, it doesn't seem to give control.

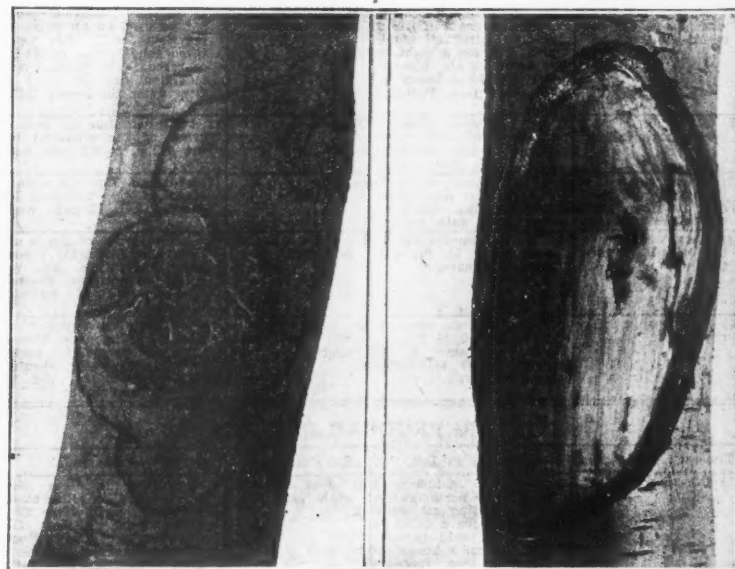
The object of this article is to inform growers of quality fruit regarding a definite procedure that will change this disease from one of serious importance to a problem that will always be present, but from which is expected only an occasional visit, and then perhaps only to a few trees.

## Symptoms—Obvious and Concealed

The disease usually attacks a tree in one or more of three vital regions.

1. *Blossom blight* is the form most destructive of a season's fruit crop. The writer is of the opinion that this occurs only in years when the spring season is relatively earlier than the normal and when the cankers which carry the disease through the dormant period are oozing the infectious material well in advance of the blossoming period. Blight in the blossoms does not occur every year or with every year of severe general infection, at least not in every state.

2. *Twig blight* is the most common form and often occurs with little or no blossom infection to precede it. However, a season of blossom infection is usually followed by more or less twig infection. Either twig or



These pictures show an over-wintering canker and how it was removed and treated. Such cankers are easily located and treated

examination of the crown. If the crown has not already been examined, and the trees marked, it would be best to expose the base of all top roots of every tree. By means of a farrier's knife, as listed under the heading "Tools," shallow gouges should be made in the outer bark of each root and of every suspicious spot on the crown and trunk.

essential if the roots on any particular side of the tree are to continue to support that portion of the top directly above.

2. The *approach graft*, using seedlings or nursery grafted trees that are long enough to span the injured area, is often necessary. These nurse trees should be planted as early as

(Continued on page 52)

# Spraying Deciduous Fruits in the Southeast

By Oliver I. Snapp, Bureau of Entomology, United States Department of Agriculture

## SPRAY PROGRAM FOR PEACHES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lime-sulphur solution, 1 part to 8 parts water, or lubricating oil emulsion, 2% for a light to moderate scale infestation, 3% for a heavy infestation (see Footnote 1). (When oil emulsion is used, add 4-4.50 Bordeaux mixture for peach leaf curl control in sections where prevalent.)	San Jose and other scale insects and peach leaf curl.	Lime-sulphur solution should not be used on peach trees in the South until after two or three good killing frosts have occurred. The lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals (pink part of flower) have fallen.	1 lb. powdered arsenate of lead, plus lime water from 3 lbs. unslaked lime to 50 gals. water.	Curculio.	If hydrated lime is used instead of unslaked lime, use 4 lbs. to 50 gals. water.
(3) When calyxes or "shucks" are shedding or when small peaches are exposed. This is usually about 10 days after the petals fall.	1 lb. powdered arsenate of lead, plus lime water from 3 lbs. unslaked lime to 50 gals. water.	Curculio.	If hydrated lime is used instead of the unslaked lime, use 4 lbs. to 50 gals. water.
(4) Two weeks after the third application, or about 4 weeks after the petals have been shed.	Self-boiled lime-sulphur, 8-8.50, alone. (No arsenate of lead in this application.)	Scab and brown rot.	If for unavoidable reasons the first spray could not be applied, use the arsenate of lead in this application with the self-boiled lime-sulphur.
(5) Four weeks before each variety is due to ripen.	1 lb. powdered arsenate of lead to 50 gals. 8-8.50 self-boiled lime-sulphur.	Curculio, brown rot, and scab.	This is a very important spray for the second brood of curculio "worms," and must be applied according to the ripening period of each variety. It is, furthermore, the most important application for brown-rot control.

## DUSTING PROGRAM FOR PEACHES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lime-sulphur solution, 1 part to 8 parts water, or lubricating oil emulsion, 2% for a light to moderate scale infestation, 3% for a heavy infestation (see Footnote 1). (When oil emulsion is used add 4-4.50 Bordeaux mixture for peach leaf curl control in sections where prevalent.)	San Jose and other scale insects and peach leaf curl.	Lime-sulphur solution should not be used on peach trees in the South until after two or three good killing frosts have occurred. The lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals (pink part of flower) have fallen.	Arsenate of lead, 5%; lime, 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(3) When calyxes or "shucks" are shedding or when small peaches are exposed. This is usually about 10 days after the falling of the petals.	Arsenate of lead, 5%; lime, 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(4) Two weeks after the third application or about 4 weeks after the petals have been shed.	Sulphur, 80%; arsenate of lead, 5%; lime, 15%.	Scab and brown rot.	
(5) Four weeks before each variety is due to ripen.	Sulphur, 80%; arsenate of lead, 5%; lime, 15%.	Curculio, brown rot, and scab.	

## SPRAY PROGRAM FOR PLUMS

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lime-sulphur solution, 1 part to 8 parts water, or lubricating oil emulsion, 2% for a light to moderate scale infestation, 3% for a heavy infestation (see Footnote 1).	San Jose and other scale insects.	Lime-sulphur solution should not be used on plum trees in the South until after two or three good killing frosts have occurred. The lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals have fallen.	1 lb. powdered arsenate of lead, plus lime water from 3 lbs. unslaked lime to 50 gals. water.	Curculio.	If hydrated lime is used instead of the unslaked lime, use 4 lbs. to 50 gals. water.
(3) When calyxes or "shucks" are shedding or when small plums are exposed.	1 lb. powdered arsenate of lead, plus lime water from 3 lbs. unslaked lime to 50 gals. water.	Curculio.	If hydrated lime is used instead of the unslaked lime, use 4 lbs. to 50 gals. water.
(4) Two weeks after the third application.	Self-boiled lime-sulphur, 8-8.50, with 1/2 lb. calcium caseinate.	Brown rot and leaf-spot.	For all varieties of plums other than the Japanese, lime-sulphur concentrate, 1 1/2 parts to 50 parts water, should be used instead of self-boiled lime-sulphur.
(5) Four weeks before ripening.	1 lb. powdered arsenate of lead, and 1/2 lb. calcium caseinate to 50 gals. 8-8.50 self-boiled lime-sulphur.	Curculio, brown rot, and leaf-spot.	For all varieties of plums other than the Japanese, lime-sulphur concentrate, 1 1/2 parts to 50 parts of water, should be used instead of the self-boiled lime-sulphur.

## DUSTING PROGRAM FOR PLUMS

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter.	Lime-sulphur solution, 1 part to 8 parts water, or lubricating oil emulsion, 2% for a light to moderate scale infestation, 3% for a heavy infestation (see Footnote 1).	San Jose and other scale insects.	Lime-sulphur solution should not be used on plum trees in the South until after two or three good killing frosts have occurred. The lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals have fallen.	Arsenate of lead, 5%; lime, 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(3) When calyxes or "shucks" are shedding or when small plums are exposed.	Arsenate of lead, 5%; lime, 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(4) Two weeks after third application.	Sulphur, 80%; arsenate of lead, 5%; lime, 15%.	Scab and brown rot.	
(5) Four weeks before ripening.	Sulphur, 80%; arsenate of lead, 5%; lime, 15%.	Curculio, brown rot, and scab.	

## SPRAY PROGRAM FOR SOUR CHERRIES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lime-sulphur solution, 1 to 8, or lubricating oil emulsion, 2% for a light to moderate scale infestation, 3% for a heavy infestation.	San Jose and other scale insects.	
(2) When 75% of the petals have fallen.	1 lb. powdered arsenate of lead, lime water from 3 lbs. unslaked lime, and 1 1/2 gals. lime-sulphur concentrate to 50 gals. water.	Curculio and leaf-spot.	
(3) Three weeks after the shedding of the petals.	1 lb. powdered arsenate of lead, lime water from 3 lbs. unslaked lime, and 1 1/2 gals. lime-sulphur concentrate to 50 gals. water.	Curculio, brown rot, and leaf-spot.	
(4) Immediately after fruit is harvested.	1 1/2 gals. lime-sulphur concentrate to 50 gals. water.	Leaf-spot.	

### SWEET CHERRIES

Sweet cherries should receive the same materials as noted for the sour varieties, except that for the summer sprays the lime-sulphur concentrate should be used in the proportion of 1 gal. to 50 gals. of water.

## SPRAY PROGRAM FOR APPLES, PEARS AND QUINCES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lime-sulphur solution, 1 part to 8 parts water, or lubricating oil emulsion, 2% for a light to moderate scale infestation, 3% for a heavy infestation (see Footnote 1).	San Jose and other scale insects.	In localities where aphids are troublesome this application should be delayed until the green can just be seen in the end of the blossom buds; if aphids are prevalent add 1/2 pt. 40% nicotine sulphate to 50 gals. water.
(2) Immediately after cluster buds have opened.	1 lb. powdered arsenate of lead and 1 1/2 gals. lime-sulphur concentrate to 50 gals. water.	Curculio, tent caterpillar, scab, etc.	Add nicotine sulphate if aphids are troublesome. This spray may be omitted on varieties not susceptible to scab.
(3) Immediately after the petals fall.	1 lb. powdered arsenate of lead and 1 1/2 gals. lime-sulphur concentrate to 50 gals. water.	Codling moth, curculio, leaf-roller, tent caterpillar, scab, etc.	This is the most important application for the codling moth, and the spray should be driven well into the calyx end of the small apples. Avoid over-spraying.
(4) Two to 3 weeks after petals fall.	1 lb. powdered arsenate of lead to 50 gals. 3-4-50 Bordeaux mixture.	Codling moth, leaf-roller, scab, leaf-spot, blotch, etc.	
(5) Three weeks after fourth application.	1 lb. powdered arsenate of lead to 50 gals. 3-4-50 Bordeaux mixture.	Codling moth, blotch, bitter and black rots.	
(6) Two to 3 weeks after fifth application.	1 lb. powdered arsenate of lead to 50 gals. 4-4-50 Bordeaux mixture.	Codling moth, bitter and black rots, and blotch.	
(7) One month before each variety is due to ripen.	1 lb. powdered arsenate of lead to 50 gals. 4-4-50 Bordeaux mixture.	Codling moth and bitter-rot.	If bitter-rot is severe, apply Bordeaux between sixth and seventh applications at 2 to 3-week intervals.

Note—Summer apples usually need only the first, second, third and fourth applications of the above spray program; however, the latest ripening summer varieties may need the fifth and sixth. Pears and quinces usually require only applications 1, 3, 4 and 6, and Bordeaux mixture may be used in place of the lime-sulphur on these fruits.

## SPRAY PROGRAM FOR GRAPES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During winter when vines are dormant.	Lime-sulphur solution, 1 part to 8 parts water, or lubricating oil emulsion, 2% for a light to moderate scale infestation, 3% for a heavy infestation (see Footnote 1).	Scale insects.	
(2) Just before blossoms open.	1 1/2 lbs. powdered arsenate of lead to 50 gals. 4-3-50 Bordeaux mixture.	Flea-beetles, rose-chafers, anthracnose, black-rot, and mildew.	
(3) After blossoms fall.	1 1/2 lbs. powdered arsenate of lead to 50 gals. 4-3-50 Bordeaux mixture.	Flea-beetles, rose-chafers, grape leaf-folders, anthracnose, black-rot, and mildew.	
(4) Two weeks later.	1 1/2 lbs. powdered arsenate of lead, 1/4 pt. nicotine sulphate, and 1/2 lb. calcium caseinate, to 50 gals. 4-3-50 Bordeaux mixture.	Leaf-hoppers, aphids, leaf-folders, and fungous diseases.	
(5) Two weeks before fruit is due to ripen.	1 lb. neutral copper sulphate or basic acetate copper, and 1/2 lb. calcium caseinate to 50 gals. water.	Black-rot and mildew.	

## SPRAY PROGRAM FOR BLACKBERRIES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) During late winter just before growth starts.	1 gal. lime-sulphur concentrate to 8 parts water.	Scale insects and anthracnose.	
(2) When new shoots are 6 ins. high.	1 gal. lime-sulphur concentrate to 40 gals. water.	Anthracnose.	Add arsenate of lead, 1 lb. to 50 gals. water if chewing insects are troublesome.
(3) When new shoots are 10 ins. high.	1 gal. lime-sulphur concentrate to 40 gals. of water.	Anthracnose.	Add arsenate of lead in proportion 1 lb. of the powder to 50 gals. of water if chewing insects are troublesome.
(4) Just before blossoms open.	1 gal. lime-sulphur concentrate to 40 gals. water.	Anthracnose.	Add arsenate of lead, 1 lb. to 50 gals. water, if chewing insects are troublesome.

## SPRAY PROGRAM FOR STRAWBERRIES

Time of Application.	Material to Use.	For Control of.	Remarks.
(1) Just before blossoms open.	4-4-50 Bordeaux mixture.	Leaf-spot.	
(2) After blossoms open.	4-4-50 Bordeaux mixture.	Leaf-spot.	Add 1 lb. powdered arsenate of lead to 50 gals. of spray if leaf rollers or flea beetles are present.
(3) Two weeks later.	4-4-50 Bordeaux mixture.	Leaf-spot.	Same as for (2).

Footnote 1—The stock lubricating oil emulsion usually contains 66 2/3% of oil. Add 6 gals. of this stock emulsion to 104 gals. water to make a 2% emulsion, or 9 gals. to 191 gals. water to make a 3% emulsion.

Recommendations for disease control in above schedules furnished by the Office of Fruit Disease Investigations, Bureau of Plant Industry, United States Department of Agriculture.



# Spray Schedule for New York

Prepared by Entomologists and Plant Pathologists of the New York State Agricultural Experiment Station and the New York State College of Agriculture

## APPLES

Time of Application.	Spray Mixtures.	Enemy.	Dust Mixtures.
Delayed dormant. When leaves of blossom buds are out $\frac{1}{4}$ to $\frac{1}{2}$ in.	Lime-sulphur, 11 gals.; lead arsenate, $2\frac{1}{2}$ lbs.; nicotine sulphate, $\frac{3}{4}$ pt.; water to make 100 gals.	Scab, scale, blister mite, bud moth, leaf-roller, case-bearers, aphids.	No satisfactory dust for scale or blister mite. Rosy aphid has not been so efficiently combated with dust as with sprays, and it is doubtful if a 2% nicotine dust applied during the delayed dormant period will afford adequate protection.
Pre-blossom. When blossoms show pink or earlier if a rainy period threatens.	Lime-sulphur, $2\frac{1}{2}$ gals.; lead arsenate, $2\frac{1}{2}$ lbs.; nicotine sulphate, 1 pt.; water to make 100 gals.	Scab, green fruit worms, bud moth, leaf-roller, casebearers.	Apply 90-10 sulphur-lead arsenate dust.* If conditions are favorable for a bad outbreak of scab, spray as much as possible, using dust to complete the operation on time.
Calyx. When the last of the petals are falling.	Lime-sulphur, $2\frac{1}{2}$ gals.; lead arsenate, $2\frac{1}{2}$ lbs.; nicotine sulphate, 1 pt.; water to make 100 gals.	Scab, codling moth, green fruit worms, bud moth, curculio, lesser apple worm, red bugs.	Apply 90-10 sulphur-lead arsenate dust.* For red bugs, use 90-10 dust with 2% nicotine. If conditions are favorable for a destructive outbreak of scab, spray as much of the orchard as possible, using dust in a supplementary capacity.
Later sprays. To be determined by weather conditions and control of scab.	Lime-sulphur, $2\frac{1}{2}$ gals.; lead arsenate, $2\frac{1}{2}$ lbs.; water to make 100 gals.	Scab, codling moth, curculio, lesser apple worm, apple maggot.	Later applications with 90-10 sulphur-lead arsenate dust.* During prolonged rainy periods it is advisable to make applications of dust at shorter intervals than indicated for spray mixtures.

\*Copper lime dust may cause russetting, especially at the calyx application. At this time use spray or 90-10 sulphur-lead arsenate dust.

## PEACHES

Time of Application.	Spray Mixtures.	Enemy.	Dust Mixtures.
Late fall or early spring, before buds swell.	If scale is abundant, use lime-sulphur, 11 gals.; water to make 100 gals. If there is no scale, use lime-sulphur, 6 $\frac{1}{2}$ gals.; water to make 100 gals.	San Jose scale, leaf curl.	Dust not advised.
When blossoms show pink.	Sulphur-lime dry mix.	Blossom blight, brown-rot.	Apply 95-5 sulphur-lead arsenate dust.
When shucks are falling.	Sulphur-lime dry mix and arsenate of lead, 3 lbs. in 100 gals.	Brown-rot, scab, curculio.	Apply 90-10 sulphur-lead arsenate dust.
Two or three weeks after shucks fall.	Sulphur-lime dry mix.	Brown-rot, scab.	Apply 95-5 sulphur-lead arsenate dust.
Two to four weeks before fruit ripens.	Sulphur-lime dry mix.	Brown-rot, scab.	Apply 95-5 sulphur-lead arsenate dust.

Dry mix sulphur-lime is prepared as follows:

Superfine sulphur.....16 lbs.  
Hydrated lime.....8 lbs. } For 100 gals.  
Calcium caseinate...1 lb.

Mix the materials dry, then add to the water in the spray tank while agitator is running.

## CHERRIES

Time of Application.	Spray Mixtures.	Enemy.	Dust Mixtures.
Delayed dormant. When bud scales separate and expose green blossom buds.	(For sweet cherries only.) Lime-sulphur, 11 gals.; nicotine sulphate, $\frac{3}{4}$ pt.; water to make 100 gals. or nicotine sulphate, $\frac{3}{4}$ pt.; soap, 5 or 6 lbs.; water to make 100 gals.	Scale, aphids.	No satisfactory dust for scale. Control of aphid by 90-10 sulphur-lead arsenate dust with 2% nicotine not yet demonstrated. Thorough dusting with 2% nicotine dust should reduce number of insects.
Just before blossoms open.	Lime-sulphur, $2\frac{1}{2}$ gals.; water to make 100 gals.	Brown-rot, blossom blight.	Apply 95-5 sulphur-lead arsenate dust.
When petals fall.	Lime-sulphur, $2\frac{1}{2}$ gals.; (sweet cherries, 2 gals.); arsenate of lead, $2\frac{1}{2}$ lbs.; water to make 100 gals.	Leaf-spot, brown-rot, curculio.	Apply 90-10 sulphur-lead arsenate dust, or if curculio is abundant, 80-20 sulphur-lead arsenate dust.
Ten days after petals fall or when shucks are off.	Lime-sulphur, $2\frac{1}{2}$ gals.; (sweet cherries, 2 gals.); arsenate of lead, $2\frac{1}{2}$ lbs.; water to make 100 gals.	Leaf-spot, brown-rot, curculio.	Apply 90-10 sulphur-lead arsenate dust, or if curculio is abundant, 80-20 sulphur-lead arsenate dust.
As Early Richmond cherries show red on one side.	Lime-sulphur, $2\frac{1}{2}$ gals.; (sweet cherries, 2 gals.); arsenate of lead, $2\frac{1}{2}$ lbs.; water to make 100 gals.	Maggot, leaf-spot, brown-rot.	The merits of dusting in controlling fruit-flies are not definitely established; if dusting is preferred, apply 90-10 sulphur-lead arsenate dust.
As Montmorency cherries show red on one side.	Lime-sulphur, $2\frac{1}{2}$ gals.; (sweet cherries, 2 gals.); arsenate of lead, $2\frac{1}{2}$ lbs.; water to make 100 gals.	Maggot, leaf-spot, brown-rot.	The merits of dusting in controlling fruit-flies are not definitely established; if dusting is preferred, apply 90-10 sulphur-lead arsenate dust.
After picking.	Lime-sulphur, $2\frac{1}{2}$ gals.; (sweet cherries, 2 gals.); arsenate of lead, 1 to 2 lbs.; water to make 100 gals.	Leaf-spot.	Apply 95-5 sulphur-lead arsenate dust.

CURRENT and gooseberry foliage is often stripped from the plants in the spring by the imported currant worm, unless preventive measures are taken. The insects feed on the leaves, starting at the lower parts of the bushes. Often the plants are practically stripped of foliage before their presence is noted. When mature, the worms are less than an

inch long, and they have a black head and a body marked with numerous black spots.

If currant or gooseberry foliage is dusted or sprayed with hellebore, such damage can be readily prevented. Hellebore gives off a volatile gas, and it will destroy the insects without damaging or discoloring the fruit. It may be applied as a dust in the dry

form, or it may be mixed with water at the rate of one ounce to a gallon of water and applied as a spray. Care should be taken to secure fresh material, for it deteriorates rapidly. It should be kept in tightly sealed glass jars.

If treatment is given very early in the season, an arsenical poison may be applied with safety. However,

many people object to such materials, especially when the fruit has reached some size. Lead arsenate is the most desirable arsenical poison to use.

"Yes," said the opalescent angel to the dreaming printer, "after this life thou wilt live again."

"Is it absolutely necessary?" begged the printer, as he fell out of bed.

## PEARS

Time of Application.	Materials.	Enemy.
Dormant. Early in the spring when the adult thrips first appear on the buds, just as the bud scales begin to separate.	Miscible oil, 5 gals.; nicotine sulphate, 1 pt.; water to make 100 gals.	Thrips.
Cluster bud. When cluster buds have separated (Bartlett); when they begin to separate (Kieffer).	Lime-sulphur, 11 gals.; water to make 100 gals.	Scale, scab, psylla eggs.
Calyx. Just after petals fall.	Lime, 30 to 40 lbs.; copper sulphate, 2 lbs.; arsenate of lead, $2\frac{1}{2}$ lbs.; nicotine sulphate, 1 pt.; water to make 100 gals.	Codling moth, psylla nymphs, scab.
About 2 weeks after petals fall.	Lime-nicotine dust (2% nicotine). For scab susceptible varieties use Bordeaux mixture, 3-10-50.	Psylla flies, scab.
Emergency application in summer when psylla become abundant.	Lime, 30 to 40 lbs.; copper sulphate, 2 lbs.; nicotine sulphate, 1 pt.; water to make 100 gals. Lime-nicotine dust (2% nicotine).	Psylla nymphs, scab. Psylla flies.

\*The use of lime-sulphur solution at this time is not advised because of the danger of foliage injury. For those who do not wish to use the lime-copper sulphate mixture, the following is suggested:

Hydrated lime.....8 lbs.  
Superfine sulphur.....16 lbs. } For 100 gals.  
Calcium caseinate.....8 lbs.

The material can be mixed dry during the winter or rainy weather and stored for use. It is prepared in the spray tank as follows: Fill the tank half full of water; then, with agitator running, add the dry material slowly, directing the spray nozzle upon the material until it has all disappeared in the water. One pint of nicotine sulphate,  $2\frac{1}{2}$  lbs. of arsenate of lead and 32 lbs. of hydrated lime are then added to each 100 gals. of water.

## PLUMS

Time.	Materials.	Enemy.
While buds are dormant.	Lime-sulphur, 1 to 8 (all varieties).	Scale.
When shucks are off young fruits.	Lime-sulphur, 1 to 50; arsenate of lead, $2\frac{1}{2}$ lbs. (All varieties except Japanese).	Leaf-spot, brown rot, curculio.
From 14 to 20 days later.	Lime-sulphur, 1 to 50. (All varieties except Japanese.)	Leaf-spot, brown rot.
Before fruit ripens.	Lime-sulphur, 1 to 50. (All varieties except Japanese.)	Leaf-spot, brown rot.

## JAPANESE VARIETIES

On Japanese varieties follow the same schedule as to time of spraying. For the application when the buds are dormant, use lime-sulphur, 1 to 8, as directed above. For subsequent applications, instead of lime-sulphur solution use self-boiled lime-sulphur, 8-8-50, lime sulphur glue mixture, or sulphur dust. When poison is needed in the dust, use 10% dry powdered arsenate of lead and 90% sulphur. Replace the lead with filler when poison is not needed.

## GRAPE SPRAY SCHEDULE FOR FINGER LAKES REGIONS

Time of Application.	Materials.	Enemy.
About 1 week before the blossoms open.*	Bordeaux mixture, 4-4-50.	Black rot, mildew.
As soon as the berries set.	Bordeaux mixture, 4-4-50. If larvae of flea-beetle are present, add arsenate of lead, $1\frac{1}{2}$ lbs.	Black rot, mildew, flea-beetle.
Two weeks later. Subsequent applications to be determined by weather conditions and the previous control of black rot and mildew.	Bordeaux mixture, 4-4-50.	Black rot, mildew.

\*If black rot has been severe in past years, make an early application when the second or third leaf is showing, using Bordeaux mixture, 4-4-50.

Grape leaf hopper may be controlled by very thorough spraying, using the following formula: Bordeaux mixture, 4-4-50; nicotine sulphate,  $\frac{1}{2}$  pt. in 50 gals. of water. The application should be made soon after July 4 when the newly hatched nymphs are on the leaves. An upturned nozzle must be used and care taken to hit the insects. Unless the leaf hoppers are extremely abundant, a special spray for this insect is not likely to be profitable.

## GRAPE SPRAY SCHEDULE FOR CHAUTAUQUA GRAPE REGION

Time of Application.	Materials.	Enemy.
Just as soon as the fruit has set. Make special effort to place spray on the clusters.	Bordeaux mixture, 4-4-50; arsenate of lead, $1\frac{1}{2}$ lbs.; resin fish oil soap, $1\frac{1}{2}$ lbs.	Berry-moth, powdery mildew.
This is a special berry-moth spray and can be omitted if the pest is not present.		
When the root-worm beetles first appear in numbers.	Same as above.	Root-worm, berry-moth, powdery mildew.
Ten days to 2 weeks later.	Same as above.	Root-worm, berry-moth, powdery mildew.
When the maximum number of leaf hopper nymphs are present, usually between July 12 and 20.	Nicotine sulphate, $\frac{3}{4}$ pt.; resin fish oil soap, 3 lbs.; or hydrated lime, 8 lbs.; water to make 100 gals.	Leaf-hopper.
During certain seasons this spray can be combined with the preceding.		
Special rose chafer spray. Apply as soon as the beetles appear.	Confectioners' glucose, 25 lbs.; or cheap molasses, 2 gals.; arsenate of lead, 5 lbs.; water to make 100 gals.	Rose chafer.

## GENERAL REMARKS

Arsenate of Lead—The amount of arsenate of lead is given in these schedules for powder form; if paste form is used, twice as much is required.

Lime-sulphur—The directions for lime-sulphur are based on the standard strength 32 to 34 degrees Baume solution.

# Orchard Spray Program for the Pacific Northwest

By Leroy Childs, Hood River Experiment Station, and H. P. Barss, Oregon Agricultural Experiment Station

On account of the climatic differences existing between the more humid orchard sections west of the Cascade Mountains and the semi-arid or arid irrigated regions east of this range, the conditions as to pests and diseases are different and require a somewhat different spray program. In general there are a greater number of diseases and pests to be sprayed for in western Oregon, Washington and British Columbia than in the drier orchard sections of the interior. Hence the full spray program for the section west of Cascades will be presented and then followed by paragraphs outlining the program for other sections.

## SPRAY PROGRAM I

For humid sections of Washington, Oregon and British Columbia west of Cascades

### APPLES AND PEARS

Time of Application.	Pest or Disease.	Spray Material and Strength.
(1) Dormant spray. As winter buds swell just before opening.	San Jose scale, blister mite and spider mites. (Footnote 6.) Apple leaf roller. (Footnote 5.) Scab and powdery mildew.	Lime-sulphur 12 to 100 or miscible oil 8 to 100. Dormoil 8 or 10 to 100. Lime-sulphur 3½ to 100.
(2) Pre-pink (delayed dormant) spray. Cluster buds separating just enough to expose blossom buds.	Anthracnose (Footnote 4) and scab. Aphids on apple. (See Footnote 1.)	Bordeaux, 6-6-50. Add nicotine sulphate ¼ lb. to 100 gals. of spray.
(3) Pink or pre-blossom spray. Just before blossoms open.	Scab and mildew. Fruit worms on pear and bud moth.	Lime-sulphur 2½ to 100. Add lead arsenate 3 lbs. to 100 gals. of spray.
(4) Calyx spray. As last petals fall. Before apple calyx closes on central fruit in cluster.	Scab and mildew. Codling moth on apple. Fruit worms on pear (if pink spray was not applied).	Lime-sulphur 2½ to 100. (Footnote 2.) Lead arsenate 2 lbs. to 100 gals. Lead arsenate 2 lbs. to 100 gals.
(5) Fifteen-day spray. About 15 days after petals fall.	Leaf roller, where infestation is moderate. Scab and mildew.	Lead arsenate 4 lbs. to 100 gals. Lime-sulphur 2 to 100 (Footnote 2).
(6) Thirty-day or first cover spray for worms. Three to five weeks after petals fall.	Pear slug. Codling moth. (Footnote 3.)	Lead arsenate 2 lbs. to 100 gals. Lead arsenate 2 lbs. to 100 gals.
(7) July spray. July 10 to 25 depending on locality and season.	Scab and mildew. Codling moth, second generation. Anthracnose canker.	Non-caustic or wettable sulphur spray (see "Spray Pointers"). Lead arsenate 2 lbs. to 100 gals. (See Footnote 4.)
(8) August spray. August 10 to September 5 depending on season and locality.	Codling moth. (May usually be omitted on pear.)	Same as for No. 7.

Footnote 1. Where aphids are very bad, especially with varieties somewhat resistant to scab, omit nicotine from Spray No. 2, adding it to Spray No. 3, which should then be applied just as soon as the blossom buds separate from each other. For severe infestations of brown aphids, the most satisfactory spray used in the Hood River Valley has been the oil spray applied as indicated in Application No. 1 just as the buds begin to show green. However, if blister mite is present, see Footnote 6.

Footnote 2. Ordinary lime-sulphur will rust the skin of some varieties of pears like d'Anjou, Comice and Howell and may cause burning of apples when hot weather comes on. Under such circumstances substitute a non-caustic or wettable sulphur spray. See "Spray Pointers."

Footnote 3. Codling Moth control is such a complex problem and of such outstanding importance, that too much dependence should not be placed upon a general spray program of this nature. Supplement the suggested program with all the trained assistance and advice obtainable. The most important period in codling moth control begins with the calyx spray and extends 4 or 5 weeks thereafter. Where worm losses have been heavy, keep fruit thoroughly covered during this period as first brood worms are very active and the fruit rapidly loses its protective coating because of rapid growth. The late cover spray may usually be omitted on pear. Supplement the spraying by the careful collection of wormy fruit at thinning time; if pears, scrape the scaly bark from the trees during February and March, band the trees in June and destroy the accumulated worms every 2 weeks. For bad worm infestations use 4 lbs. lead arsenate to 100 gals. throughout the season. Codling moth is not a commercial orchard pest of British Columbia and no program of control is required.

Footnote 4. Anthracnose or black spot canker and fruit rot may be successfully prevented by a single thorough summer application of Bordeaux mixture 4-4-50. Where the disease is reasonably well under control, recent studies conducted at the Hood River Experiment Station indicate that Bordeaux mixture 6-6-50 when substituted for lime-sulphur in Spray No. 2 is of much value in reducing infection without the disadvantage caused by the coating of the fruit with Bordeaux in the summer. The spring Bordeaux spray, however, must be applied before the fruit buds are much exposed, to avoid russetting. Bordeaux 6-6-50 applied with the oil spray is also proving of great value in the Hood River district in reducing anthracnose. In filling tank, add lime first. Fill tank two-thirds full, slowly add dissolved bluestone, lastly add oil, which, before adding, should be stirred up and emulsified with an equal amount of water. A very thorough application is necessary as this spray must stay on the trees until fall, at which time it becomes effective in controlling the disease.

Footnote 5. Leaf Rollers occur as a major pest only in certain of our fruit sections. Oil emulsion in the early pre-pink (delayed dormant) in the standard spray. Dormoil has given uniformly better results in leaf roller control than other western oils. Some miscible oils are apparently of little value in control. Where conditions develop that prevent maximum effectiveness from the oil spray and for very light infestations of leaf-roller, use double strength lead arsenate (4 to 100) in the pink and calyx sprays.

Footnote 6. Blister mite on apple, during the past two or three years, has become one of the most serious pests of this fruit in the Northwest. Tests conducted during the past year at the Hood River Station indicate lime-sulphur to be the best means of control and should be used in all orchards where this mite is present in serious numbers. Apply lime-sulphur 10 to 100 (12 to 100 if the scale is present) any time after trees go dormant in the fall or in the spring before buds begin to open. Control cannot be obtained after green begins to show on buds. Oil 8 to 100 is effective during a much more limited time; this period is between the time scales are separating on buds and before green tips show. Warm, sunny weather greatly assists in increasing control. Every bud in the tree must be hit with the spray material as in these buds the mites over-winter.

Footnote 7. Three species of red spiders are troublesome in the apple and pear orchards of the Northwest. In some sections all are present, in others one or two of the three are present. Control measures for two are alike but for the third species a different recommendation must be made. On account of this situation, it is necessary to know the particular spider giving trouble. The so-called European red spider and the brown mite over-winter in the egg stage on the tree. The third species, or so-called common red spider, hibernates in trash on the ground and is not on the trees when the first spray is applied. Oil spray at the rate of 3% or more is recommended for the first two species indicated. For the common red spider, the usually recommended sulphur sprays applied during early spring are quite effective. If all three of these pests are troublesome in the summer, a weak oil spray containing ½% to ¾% of lubricating oil is recommended.

### PRUNES AND PLUMS

(1) Dormant spray. As winter buds are ready to open.	San Jose scale, spider mite, twig miner.	Lime-sulphur 12 to 100. If scale is absent dilute 8 to 100.
(2) Pre-blossom spray. Buds white just before opening.	Brown rot (Monilia) blossom blight. Bud moth. Syneta beetle. Aphids.	Bordeaux 4-4-50 with spreader or lime-sulphur 3 to 100. Lead arsenate 2 lbs., lime 2 lbs. to 100 gals. Lead arsenate 4 lbs., lime 2 lbs. to 100 gals. Nicotine sulphate ¼ lb. to 100 gals.
(3) First fruit spray. As soon as shucks fall.	Cylindrosporium leaf spot and brown rot.	A non-caustic or wettable sulphur spray. See "Spray Pointers."
(4) and (5) About June 1 and July 1.	Cylindrosporium or brown rot if troublesome.	As under (3) or use dusting sulphur.
(6) August spray. About a month before harvest.	Brown rot.	As under (3) or use dusting sulphur.

### PEACHES

Time of Application.	Pest or Disease.	Spray Material and Strength.
(1) Leaf curl spray. From December to mid-February.	Peach leaf curl.	Bordeaux mixture 6-6-50.
(2) Late dormant spray. Just as first buds are ready to open.	Peach twig miner, San Jose scale, spider mite. Bud moth.	Lime-sulphur 12 to 100. If scale is absent, dilute 8 to 100. Lead arsenate 2 lbs., lime 2 lbs. to 100 gals.
(3) First fruit spray. As soon as shucks fall.	Peach blight (fruit spot), mildew or brown rot.	A non-caustic or wettable sulphur spray. See "Spray Pointers." If had repeat once or twice at 2 or 3-week intervals.
(4) Late summer spray. About 6 weeks before harvest.	Brown rot.	Same as No. 3 or use dusting sulphur when air is still.
(5) Early fall spray. As soon as each variety is picked.	Peach blight and die back.	Bordeaux 4-4-50.

### CHERRIES

For San Jose Scale—Same as No. 1 on prune program.  
For Aphids—Use nicotine sulphate, 1 lb. to 100 gals. with pre-blossom spray (same as No. 2 for prunes). Use tanglefoot bands on trees to prevent reinfestation of aphids by ants.  
For Syneta Beetle—Use lead arsenate 4 lbs., plus lime 2 lbs., and 100 gals. water. The first year Syneta control is applied put on this spray just before and just after blossoming; in succeeding years before bloom only.  
For Cherry Fruit Maggot—Use the following sweetened poison spray for adult flies: lead arsenate, ½ lb.; syrup, 2 qts.; water, 8 gals. Apply about 1 qt. to the tree, spraying the upper surface of the outer leaves only, when adult flies appear. This will be from June 8 to 20. Repeat application 10 days later and give a third spray one week after second.  
For Brown Rot (Monilia) Blossom Blight—Same as No. 2 on prune program.  
For Cylindrosporium Leaf Spot (Yellow Leaf)—Same as Nos. 3, 4, 5, on prune program.  
For Brown Rot on Fruit—Use a non-caustic or wettable sulphur spray or sulphur dust 1 month before picking. Begin earlier if disease shows up sooner and repeat every 2 or 3 weeks till a month before picking.

### APRICOTS

For Brown Rot (Monilia) Blossom Blight—Same as No. 2 on prune program. Where blossom blight has become very severe and in very wet springs, a similar spray may be desirable as the winter buds open, and another about in full bloom. Prune out and destroy all dead twigs and spurs in winter.  
For Fruit Spot (Peach Blight fungus). Same as Nos. 3 and 5 on peach program.  
San Jose Scale and other insects—Same control as for similar insects on peach.

## SPRAY PROGRAM II

For semi-arid sections of the Northwest east of Cascade Range and for Rogue River Valley in Oregon.

### APPLES AND PEARS

Scab—Present and troublesome only in a few localities. Where sufficiently abundant to justify spraying, apply Nos. 3 and 4 in Program 1 for apples and pears.  
Powdery Mildew—Use applications Nos. 2, 3, 4 and 5 in Program 1 for apples. Continue if necessary. Observe Footnote 2. Use casein spreader first dissolved in water. Supplement by winter and summer pruning out. Pink spray most important to avoid sulphur shock.  
Codling Moth—Following the calyx application, the first cover spray (15 to 30 day) is applied just before the first worms hatch. In general this will be earlier for interior (15 days) than for coast area. Follow with second cover spray 2 weeks after first cover spray; third cover spray, 4 weeks later; and fourth cover spray, 4 weeks after third.  
For southern Oregon an additional late cover spray may be necessary. Double strength lead in late sprays advisable. Calyx spray on pears likewise advisable in southern Oregon.  
For eastern Washington, northern Idaho, the Grande Ronde Valley of Oregon, follow Program 1, although in higher altitudes probably two cover sprays will generally suffice.  
Citrus Red Spider—Use spray No. 1 in Program 1.  
Blister Mite—Use spray No. 1 in Program 1. For apple see Footnote 6.  
Leaf Rollers, Fruit Worms, San Jose Scale, Aphids—Follow Program 1 for these insects.

### PEACHES

Leaf Curl, Mildew and California Blight, Twig Miner, San Jose Scale, Spider Mite—Follow Program 1 for these diseases and insects.

### CHERRIES

Practically no fungous diseases requiring spray. Insects in general would require no regular program of sprays. For specific pests follow Program 1 for cherries.

### APRICOTS

California Blight—Follow Program 1 for peach blight. Insect pests and treatment same as for peaches in Program 1.

### PRUNES AND PLUMS

No fungous diseases requiring spray as a rule.  
San Jose Scale, Twig Miner and Spider Mite are principal insect pests. Where present control with spray No. 1 in Program 1 for prunes and plums.

### SPRAY POINTERS

The proportions of lime-sulphur recommended for sprays in this program are based on the use of the standard concentrated liquid lime-sulphur testing about 32 degrees by Baume hydrometer test. Where 4 lb. of the standard concentrated liquid lime-sulphur is used, it will take about 4 lbs. of the dry powder to equal in active ingredients 1 gal. of the standard concentrated liquid lime-sulphur. For example, where this program recommends "lime-sulphur 12 to 100," the grower employing the dry form should use 48 lbs. of the dry lime-sulphur with every 100 gals. of water to get the same strength of spray.

Non-Caustic or Wettable Sulphur Sprays—Within recent years substitutes for lime-sulphur have been devised which have almost equal dusting or burning action on the leaves and hence are safer to use on tender-skinned varieties of pears and apples and on stone fruits. These sprays are not very active as fungicides or insecticides when the weather is cool and hence cannot always be relied upon for effective action in the early spring. They are, however, active in warm weather, such as may usually be expected from the time the pear and apple blossoms have fallen. They are safe and effective in warm weather in the control of scab, mildew, leaf spot and brown rot. It is usually advisable to employ a soap or casein spreader with them unless a spreader is used in the composition. These spray materials are much easier to prepare or use than the old self-boiled lime-sulphur and are to be recommended wherever the latter has been advised in the past. Among these wettable sulphur sprays may be mentioned the well-known Atomic Sulphur (use 12 lbs. to 100 gals.), "Dry-Mix" sulphur and lime, and "Oregon cold-mix" lime and sulphur. To prepare the latter, use superfine sulphur 8 lbs. and hydrated lime 4 lbs. Mix together (thoroughness not required). Pour into the mixture 2 qts. milk (skimmed is entirely satisfactory) and stir into a smooth paste, adding water if too thick, and finally pour through strainer into spray tank with enough water to make 50 gals. with the amounts of materials mentioned. Other satisfactory materials are now on the market.

The powdered form of lead arsenate is the basis of the formulas for this poison recommended in this program. If paste form is used employ double the number of pounds indicated.

Bordeaux Mixture is most satisfactory when freshly made according to standard methods. The "ready-mixed" type of commercial Bordeaux is in general decidedly inferior to good home-made spray. The type of commercial Bordeaux powders, in which the powdered bluestone and hydrated lime are sold in separate packages and added separately to the spray tank, appear to be better than the materials combined by the manufacturer. The hydrated lime must not have become air-slaked (carbonated) when used and directions must be followed carefully or poor results will be obtained.

Home-made Bordeaux must be used the same day it is made or else ordinary cane sugar must be added at the rate of 1 oz. (1 heaped tablespoon) for every 8 lbs. of stone lime or 10 lbs. of hydrated lime employed. The sugar should be dissolved before adding to the tank of Bordeaux. It prevents the spray from crystallizing and deteriorating.

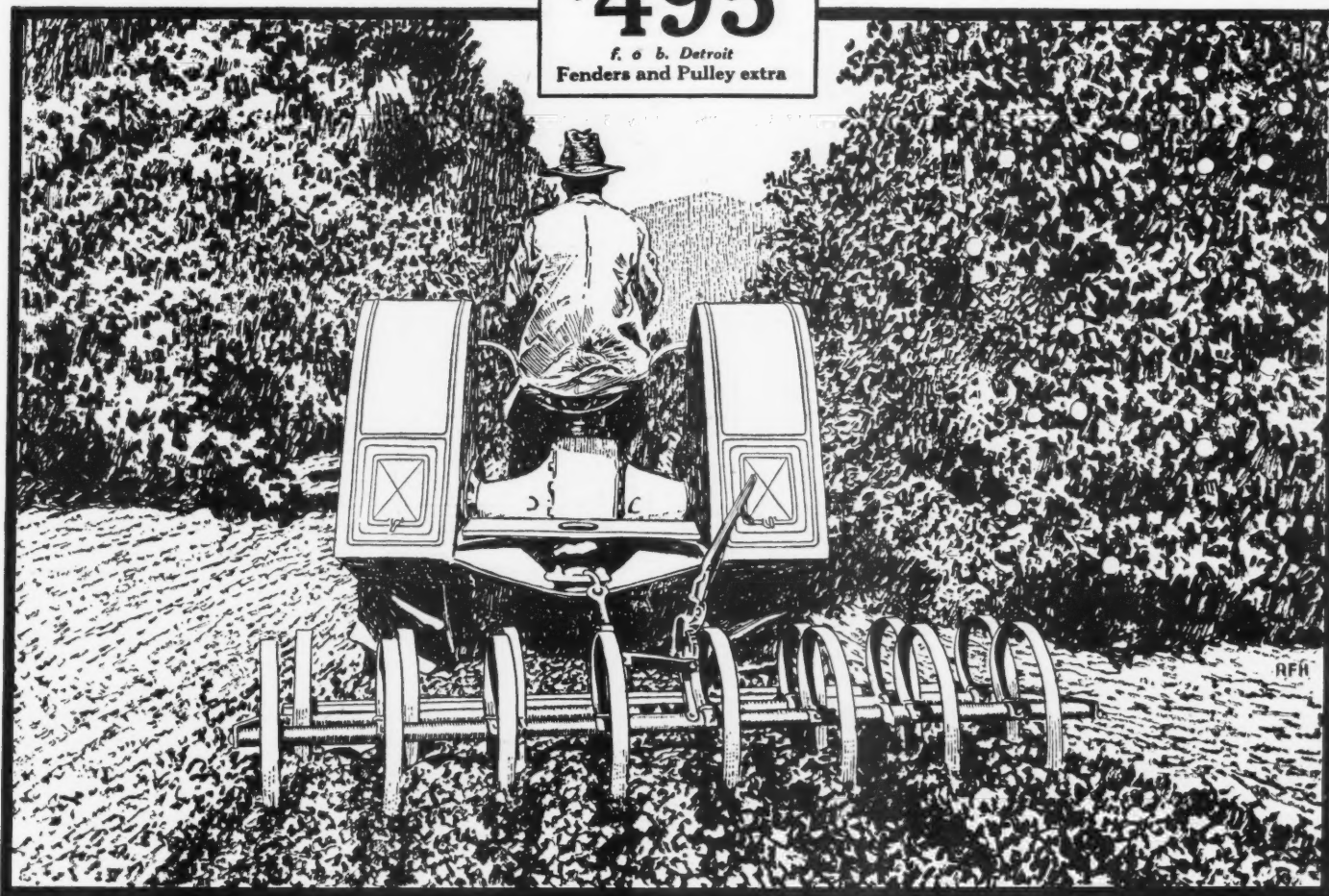
Oil sprays are increasing in popularity throughout the country. Up to the present time, however, observations made in Oregon at least do not seem to indicate that an oil emulsion of less than 6% should be recommended for the control of San Jose scale. Some growers, after using oil for several years at the above strength, are going back to the use of lime-sulphur. Probably some unknown factors are influencing results obtained in different parts of the country.

Spreader—Materials like calcium caseinate added to sprays to increase their spreading powers have not given increased control with such troubles as codling moth or scab. Spreaders do, however, improve the appearance of the fruit when it is necessary to spray just before harvesting.

Dusting—Dusting sulphur has given promising results in warm weather for mildew and brown rot control, but is not as active as ordinary lime-sulphur in cool weather and in early scab applications. No dusting material has thus far given as good results as liquid sprays for anthracnose, peach blight and other diseases requiring long, wet weather protection. The relative value of dust and spray for the control of insect pests cannot be stated exactly without further experimental work.

Spray Combinations—Any of the materials mentioned in this spray program in connection with any particular application may be successfully combined, but it is best not to add lead arsenate to a tank of diluted lime-sulphur until the last thing before starting to spray.



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*Drawn from photograph of Fordson at work on the Bradbury Estate, San Marino, Cal.*

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# Fordson

# Spray Calendar for the Middle West

By T. J. Talbert, University of Missouri

## APPLES, PEARS AND QUINCES

No. and Name of Spray and When to Apply.	For Control of.	What to Use.
(1) Dormant or delayed dormant. Any time after the leaves drop in the fall and until the blossom buds begin to open in the spring. Generally most satisfactory just as buds are swelling.	San Jose scale and other scale insects.	Lime-sulphur 1 to 7, or lubricating oil emulsions, cold or boiled oil soap emulsion, 1½ to 50. Proprietary miscible oils at dilution marked on containers.
Special spray. When buds are opening and aphid eggs are hatching.	Plant lice (aphids). Only when serious.	Oil emulsion 1½ to 50, or nicotine sulphate ¼ pt. in 100 gals. lime-sulphur, diluted 1½ gals. to 50.
(2) First summer spray (cluster bud). When individual flower buds in the cluster begin to separate, but before they open.	Plant lice (aphids), apple scab, leaf spot, curculio, canker worm.	Lime-sulphur 1½ to 50 plus 1 lb. arsenate of lead. When aphids are abundant, add nicotine sulphate ¼ pt. to 100 gals. of spray mixture.
(3) Second summer spray (calyx). Start when bloom is two-thirds off and finish before the blossom ends close. Most important single summer spray. Should be applied within a week after petals fall to be most effective.	Codling moth, plant lice (aphids), apple scab, leaf spot, curculio, canker worm, lesser apple worm.	Lime-sulphur 1½ to 50 plus 1 lb. arsenate of lead. When aphids are serious, add nicotine sulphate ¼ pt. to 100 gals. spray mixture. On account of danger of injury to fruit, Bordeaux should not be used earlier than 12 to 14 days after the calyx spray.
(4) Third summer spray. Within 12 to 14 days after calyx spray. (If curculio injury is severe, apply within 6 or 7 days after calyx spray, using lime-sulphur 1½ to 50 and 1½ lbs. arsenate of lead.)	Apple blotch, curculio, codling moth, lesser apple worm, apple scab, leaf spot, phoma spot.	Lime-sulphur 1½ to 50 plus 1 lb. arsenate of lead. Where apple blotch or phoma spot is serious, use Bordeaux mixture (3-4-50) instead of lime-sulphur.
(5) Fourth summer spray. Apply 12 to 14 days after the preceding summer spray, or No. 4.	Apple blotch, curculio, codling moth, lesser apple worm, sooty blotch, phoma spot.	Lime-sulphur 1½ to 50 plus 1 lb. arsenate of lead. If apple blotch, bitter rot, or phoma spot is serious use Bordeaux (3-4-50) instead of lime-sulphur.
(6) Fifth summer spray. Apply about 12 to 14 days after No. 5.	Codling moth, lesser apple worm, apple blotch, bitter rot, sooty blotch, curculio, phoma spot.	Lime-sulphur 1 to 50 plus 1 lb. arsenate of lead. If apple blotch, bitter rot, or phoma spot is serious use Bordeaux (3-4-50) instead of lime-sulphur.
(7) Sixth summer spray. Apply about 12 to 14 days after No. 6. Make later sprays at intervals of 10 days to 2 weeks, where apple blotch, bitter rot, or phoma spot is serious.	Codling moth, lesser apple worm, apple blotch, bitter rot, sooty blotch, curculio, phoma spot.	Same materials in the same proportions as for the fifth summer spray.

**Dusting Materials**—Comparatively few growers are now using dusts in their apple orchards because experience and observations have generally shown that where either diseases or insects are serious, liquid sprays usually give better results.

## PEACHES

No. and Name of Spray and When to Apply.	For Control of.	What to Use.
(1) Dormant spray. Any time after the leaves drop in the fall and before the buds swell in the spring.	San Jose scale, peach leaf curl.	Lime-sulphur 1 to 7, or oil emulsion, cold or boiled, at the rate of 1½ to 50 in 5-5-50 Bordeaux.
Special spray. Before the buds swell in the spring.	If scale is absent, for peach leaf curl.	Bordeaux 5-5-50 or lime-sulphur 5 to 50.
(2) First summer spray. Just as the hucks fall from the young fruit or about 7 days after the bloom drops.	Curculio, brown rot.	1 lb. arsenate of lead and 3 lbs. freshly slaked lump lime to 50 gals. water, or if brown rot has been serious, use 8-8-50 self-boiled lime and sulphur or 12½ lbs. dry-mix sulphur lime to 50 gals. water, plus 1 lb. arsenate of lead.
Special spray. If curculio is serious repeat this spray in a week.	Curculio, brown rot.	Same materials in the same proportions as for the second summer spray.
(3) Second summer spray. About 10 to 12 days after No. 2.	Scab, brown rot, curculio.	Self-boiled lime and sulphur, 8-8-50, or 12½ lbs. dry-mix sulphur lime to 50 gals. water, plus 1 lb. arsenate of lead.
(4) Third summer spray. About 10 to 12 days after No. 3.	Scab, brown rot, curculio.	Same materials in the same proportions as for the second summer spray.
(5) Fourth summer spray. About 10 to 12 days after No. 4.	Scab, brown rot, curculio.	Same materials in the same proportions as for the third summer spray.

**Peaches**—Where San Jose scale and peach leaf curl are absent, sprays Nos. 2 and 3 will generally be adequate for early peaches. For the best protection of the fruit on varieties like Elberta, Heath, and Krummel, 2 or 3 additional sprays applied at intervals of about 12 to 14 days may be required. This will be particularly true during wet seasons. It is important, however, that the spraying work be discontinued about 3 weeks before picking time to prevent marring the appearance of the fruit and having it discriminated against upon the markets.

Self-boiled lime and sulphur is one of the best and safest sprays for peaches. This is a special spray for peaches and Japanese plums. It should not be made up until it is desired to begin the spraying work. Self-boiled lime and sulphur should not be confused with commercial lime-sulphur or the home-made lime-sulphur. The only heat used in making the self-boiled lime and sulphur is that produced by the slaking of the stone lime.

## CHERRIES AND PLUMS

(The following schedule applies to sour cherries and American plums.)

No. and Name of Spray and When to Apply.	For Control of.	What to Use.
(1) Dormant spray. Just before the buds swell in the spring.	San Jose scale, cherry scale.	Lime-sulphur 1 to 7 when scale is present. If scale is absent, this spray is not required.
(2) First summer spray. Just before the blossom buds open.	Curculio, brown rot, leaf spot.	Bordeaux 3-4-50 or lime-sulphur 1½ to 50 and 1 lb. arsenate of lead.
(3) Second summer spray. Immediately after the petals fall.	Curculio, brown rot, leaf spot.	Bordeaux 3-4-50 or lime-sulphur 1½ to 50 and 1 lb. arsenate of lead.
(4) Third summer spray. 12 to 14 days after No. 3.	Brown rot, leaf spot, curculio.	Bordeaux 3-4-50 or lime-sulphur 1½ to 50 and 1 lb. arsenate of lead.
(5) Fourth summer spray. Soon after picking the fruit.	Leaf spot, leaf-chewing insects.	Bordeaux 3-4-50 or lime-sulphur 1½ to 50. If leaf-chewing insects are present, add arsenate of lead 1 lb. to 50 gals. of spray.

**Sour Cherries**—In orchards where the fungous diseases known as brown rot and leaf spot do not occur, all the sprays as outlined above will not be needed. Since these diseases are so common in mature cherry orchards, it will generally pay to apply all the sprays as outlined.

**Sweet Cherries**—Bordeaux should never be used in spraying sweet cherries on account of the danger of the mixture doing severe injury to the fruit and foliage. Otherwise sweet cherries should receive the same treatment as sour ones, except the lime-sulphur solution should be used at the rate of 1 to 50 instead of 1½ to 50, to reduce the liability of injury from the spray mixture.

Additional summer sprays may be required to control brown rot if the season is wet. More sprays will also be required if curculio is serious. Where this is true, the sprays containing lime-sulphur and arsenate of lead should be applied at intervals of about 10 days. It is important, however, that the spraying work be discontinued at least 3 weeks before picking time to prevent marring the appearance of the fruit.

Plant lice (aphids) frequently do damage to plums and prunes. When this pest is serious, add ¼ pt. nicotine sulphate to every 100 gals. of the spray mixture.

**Japanese Plums**—For the Japanese varieties of plums, such as Burbank, Abundance, Chebot, etc., self-boiled lime and sulphur 8-8-50 should be substituted for the concentrated lime-sulphur solution. Atomic sulphur or dry-mix sulphur lime may be used in spraying Japanese varieties of plums without danger of injury.

## GRAPES

No. and Name of Spray and When to Apply.	For Control of.	What to Use.
(1) Dormant spray. A few weeks before growth starts in the spring.	Grape scale, San Jose scale, anthracnose, black rot.	Lime-sulphur 1 to 7 for both scale and anthracnose. If scale is absent, for anthracnose and black rot use Bordeaux 8-8-50.
Special bud spray. As buds are swelling. Repeat in 5 to 7 days.	Grape flea beetle.	Arsenate of lead 3 lbs. to 50 gals. water.
(2) First summer spray. When shoots are showing second or third leaf.	Black rot, anthracnose, flea beetle, rose chafer.	Bordeaux 4-4-50 and arsenate of lead 3 lbs.
(3) Second summer spray. Just before blossoms open.	Black rot, anthracnose, curculio, flea beetle, berry moth, rose chafer.	Bordeaux 4-4-50 and arsenate of lead 2 lbs.
(4) Third summer spray. As soon as the bloom is off and the fruit is set.	Black rot, anthracnose, curculio, berry moth, downy mildew, powdery mildew.	Bordeaux 4-4-50 and arsenate of lead 2 lbs.
(5) Fourth summer spray. From 10 to 14 days after the third summer spray.	Black rot, anthracnose, downy mildew, powdery mildew, grape root worm.	Bordeaux 4-4-50 and arsenate of lead 2 lbs.
(6) Fifth summer spray. From 10 to 14 days after the fourth summer spray.	Black rot, anthracnose, chewing insects.	Bordeaux 4-4-50 and arsenate of lead 2 lbs.
(7) Sixth summer spray. From 10 to 14 days after the fifth summer spray.	Black rot, other diseases and insects, if any.	Bordeaux 4-4-50 and arsenate of lead 2 lbs.

**Lime-Sulphur** is not used as a summer spray for the grape because it damages the fruit and burns the foliage.

Thorough spraying and timely applications are required in successful grape culture. More beginners in commercial grape growing fail on account of improper spraying than from any other cause.

## DUSTING PROGRAM FOR PEACHES, CHERRIES AND PLUMS

Because of the developments of the past few years in the use of dusts, some growers prefer to use these materials for stone fruits. For these the following program is suggested:

No. and Name of Application and When to Apply.	For Control of.	What to Use.
(1) Dormant spray. Dust not advised for this application.	San Jose scale, cherry scale and peach leaf curl.	Lime-sulphur 1 to 7 or oil emulsion, cold or boiled, at the rate of 1½ to 50.
(2) First summer spray. When 75% of the petals or flowers have fallen.	Curculio and brown rot.	Apply 95 to 5 sulphur-lead-arsenate dust.
(3) Second summer spray. When calyxes or shucks are shedding, about 7 days after the blossoms drop.	Curculio, brown rot and peach scab.	Apply 95 to 5 sulphur-lead-arsenate dust.
Special application. If curculio is serious, repeat in a week.	Curculio, brown rot and peach scab.	Apply 95 to 5 sulphur-lead-arsenate dust.
(4) Third summer spray. About 10 to 12 days after No. 3.	Curculio, brown rot and peach scab.	Apply 95 to 5 sulphur-lead-arsenate dust.
(5) Fourth summer spray. About 10 to 12 days after No. 4.	Curculio, brown rot and peach scab.	Apply 95 to 5 sulphur-lead-arsenate dust.

If dusts are used, 3 or 4 applications should be sufficient for early peaches. For late varieties, 6 or 7 applications may be needed at intervals of 10 or 12 days. It is usually advisable to continue the spraying or dusting up to within 4 weeks of harvest time.

Ordinary commercial sulphur is not suitable for dusting purposes. The finely ground and specially prepared sulphur and arsenicals are much more satisfactory. These products are manufactured and sold by companies dealing in spraying materials. Commercial concerns also handle machines and equipment suitable for applying dust sprays.

## PROPER USE OF LUBRICATING OIL EMULSIONS

Oil emulsions have been used in Missouri for 3 years as dormant sprays for San Jose scale control. They are not recommended as foliage or fruit sprays. When directions for preparing, diluting and applying oil emulsions as a dormant spray are strictly followed, we believe that they are effective in controlling scale. Two per cent of oil is the strength recommended as a dormant spray. Remember also that free oil, which may rise out of an improper emulsion, or from the diluted spray mixture, is liable to cause injury to fruit trees. If free oil does rise, the emulsion is not safe to use. Consult Missouri Experiment Station Circular 109 and Bulletin 216 on preparing oil emulsions. Do not spray free oil on trees. For best results, a good emulsion must be maintained at all times. Lubricating oil emulsion is not fool-proof, but, if properly prepared and applied when weather conditions are favorable for dormant spraying, experience to date shows it to be safe. This also applies to the commercial oil emulsions and miscible oils on the market.

Some have had injury and poor scale control from the use of improperly prepared and applied oil sprays, so we urge strongly, careful preparation of the oil emulsion sprays. Injury has been reported from the use of oil sprays similar to lubricating oil emulsion, when applications were made immediately before periods of cold weather. Some also fear possible cumulative injury where dormant applications are repeated several years in succession. Experiments are now under way at the College of Agriculture which will determine whether such injury is likely.

## POINTS TO BE REMEMBERED

The lubricating oil emulsions are not recommended as fungicides. There is no evidence that they have any fungicidal value. When mixed with Bordeaux 3-4-50, however, the combination spray becomes a fungicide as well as an insecticide.

(1) For the effective control of scale, liquid lime-sulphur, the lubricating oil emulsions, or miscible oils may be used. If there is any slight advantage in the matter of scale control, it is on the side of the oils.

(2) From the point of view of scale control alone, the lubricating oil emulsion sprays are the cheaper.

(3) From the point of view of possible injury to the fruit trees, lime-sulphur has a decided advantage, as it has never caused injury when applied on dormant trees. However, the oil emulsions are being used extensively for dormant sprays, and if the emulsions are properly prepared and diluted, evidence to date points to the fact that they can be safely used on dormant trees.

(4) Use ¼-½-50 Bordeaux with every tank of engine oil-soap emulsion. Stock emulsions in which free oil has separated out and come to the surface, due to freezing or any other cause, should not be used. Do not use a dilute spray mixture in which free oil has separated out and come to the surface of the tank. Stir all stock emulsions before measuring out for use. If you make your own emulsions, follow directions carefully, especially instructions to use a pump giving good pressure. The pressure given by a hand pump can usually be increased by decreasing the size of the opening of the nozzle.

(5) Careful experiments and observations in Missouri have shown that San Jose scale can be effectively controlled with lime-sulphur, lubricating oil emulsions and miscible oils. A very thorough application is necessary and each spray must be used at the proper dilution. As many growers have failed to control scale with the oil sprays as with the lime-sulphur spray, it is not, therefore, so much a matter of which spray to use as it is of thorough spraying at the right dilution. One good dormant application each year should keep the scale well under control and prevent injury to the fruit and trees.



# Spray Calendar for Florida

By W. L. Floyd, University of Florida

## GRAPEFRUIT AND SATSUMAS

Pest.	Time.	Remedy.	Remarks.
Scab. Melanose.	March or April. Soon after petals have fallen.	Bordeaux-oil mixture. Make 3-50 Bordeaux, add concentrated oil emulsion to give 1% of oil to mixture.	Important for preventing and checking these diseases on tender growth. If only melanose be present, spray about 1 month later.

## ALL SPECIES OF CITRUS

Aphids.	Early February. When first spring growth appears.	Dip of nicotine sulphate solution. Repeat in 4 days.	Bend over and dip ends of branches with new growth in a bucket containing 1 tea-spoonful of nicotine sulphate, 2 ozs. soap and 1 gal. water.
Aphids.	Later in February.	3% nicotine sulphate lime dust.	Apply in calm weather with hand duster to all infested new growth on young trees. Repeat in 4 days if necessary.
White Fly. Scale Insects. Rust Mites.	May. When fruit is 1 in. in diameter.	Oil emulsion diluted to contain 1 part oil to 99 parts water, then add 2½ lbs. dry soda-sulphur to 100 gals.	Oil emulsion sometimes injures small fruit; it should be 1 in. or over in diameter to be safe.
Rust Mites. Red Spiders.	June. During dry weather.	Dust with flowers of sulphur, or spray with lime-sulphur, 1 gal. to 50 gals. water.	Watch for mites. Apply before they become numerous.
White Fly. Scale Insects.	Early in July. After rainy season begins.	Parasitic Fungl. Red Aschersonia. Red-headed fungus.	Dissolve spores off in water, strain and apply with a clean hand sprayer. If obtainable add spores of Brown, Gray-headed and Black fungi.
White Fly. Scale Insects. Rust Mites.	October or November.	No. Oil emulsion in which soda-sulphur is dissolved.	Same proportions as given in second.

## SPECIAL SPRAYING NOT USUALLY NECESSARY UNDER NORMAL CONDITIONS

Scab.	Early February. Before new foliage unfolds.	Bordeaux-oil mixture.	Same as first on Grapefruit and Satusmas where much scab is present. Important on young non-bearing trees. Prune out diseased parts as much as possible before spraying.
Aphids.	February and March.	3% nicotine sulphate lime dust.	Apply in calm weather with power duster to all infested new growth on large trees. Repeat every 4 days as long as aphids are found.
Thrips.	March. When about one-half the petals have fallen.	Nicotine sulphate with lime-sulphur. Use 13 oz. nicotine sulphate and 2½ gals. lime-sulphur to 100 gals. water. More often necessary on Satusmas.	Apply when 25 or more thrips are found to the blossom.
Rust Mites. Red Spiders.	August or September. When mites become noticeable.	Dust with flowers of sulphur, or spray with lime-sulphur 1 to 50.	Watch for mites if weather becomes dry. Apply before they become numerous.
Ammoniation of fruit.	October or November.	Apply copper sulphate, spread like fertilizer about tree, 2 lbs. to 6 lbs. per tree.	This prevents development of ammoniation on next crop of fruit.

## AVOCADOS

Pest.	Time.	Remedy.	Remarks.
Scab (Cladosporium Citri). Black Spot (Colletotrichum sp.). Blotch (Cercospora sp.).	March. (1) Latter part of blooming period. (2) Three weeks later. (3) Three or 4 weeks later.	3-3-50 Bordeaux mixture.	Three sprayings are usually sufficient, though a fourth may sometimes be necessary.
Scale Insects. White Fly.	October. As foliage begins to harden. Repeat in December.	Oil emulsion, 1 to 70.	Alternate this with spraying for thrips, lace bugs and spiders, when they are present.
Leaf Thrips. Lace Bugs. Red Spiders.	November to March, when pests are found.	Lime-sulphur 1 to 60 plus 40% nicotine sulphate 1 to 900.	Alternate with spraying for scale insects and white fly.
Flower Thrips. Blossom Anomala. Leaf Roller.	Early March when in bloom if pests are found.	40% nicotine sulphate, 13 oz. to 100 gals. water, then add fish oil soap, 2 lbs.; arsenate of lead, 3 lbs.	Unless thrips are numerous omit nicotine sulphate and soap.

## MANGOES

Anthracnose (Colletotrichum gloeosporioides). Blossom Anomala.	March. When in bloom.	3-3-50 Bordeaux mixture, 1½ lbs. arsenate of lead.	
Red Spiders. Leaf Thrips.	November to March when pests are found.	Lime-sulphur, 1 to 60, plus 40% nicotine sulphate, 1 to 900.	Repeat as often as necessary.
Scale Insects.	December to February. When trees are dormant.	Oil emulsion, 1 to 70.	Alternate this spraying with one for Spiders and Thrips. Two or more sprayings may be necessary.

## PINEAPPLES

Soft Rot (Thielaviopsis paradoxa).	Fruit after ripening.	Careful handling. Packing only when dry. Prompt shipment.	Sometimes severe among pineapples in transit.
Red Wilt (Caused by nematode).	Six to 8 weeks before setting plants.	Breaking soil deep, then applying calcium cyanamid, 1 ton to acre.	Too expensive for general use.
Red Spiders. Mealy Bugs.	In periods of dry weather.	Handful of tobacco dust in bud of plant.	

# General Spray Table for the Southwest

By W. B. Lanham, Texas Agricultural Experiment Station

## APPLES AND PEARS

Pest or Disease.	Time to Spray.	Material and Strength.
(1) San Jose or other scale insects.	After leaves have fallen and until growth starts in the spring.	Commercial lime-sulphur or oil emulsion.
(2) Codling moth, plant lice, curculio, biting insects.	When 90 to 100% of petals have fallen; rush to completion.	2 lbs. arsenate of lead and ½ pt. nicotine sulphate.
(3) Codling moth, blotch, curculio, biting insects.	18 days after No. 2.	Bordeaux, 4-4-50, and 2 lbs. arsenate of lead.
(4) Codling moth, blotch, curculio, biting insects.	6 weeks after No. 3.	Bordeaux, 4-4-50, and 2 lbs. arsenate of lead.
(5) Codling moth, blotch, curculio, biting insects.	3 weeks after No. 4.	Bordeaux, 4-4-50, and 2 lbs. arsenate of lead.
(6) Codling moth, blotch, curculio, biting insects.	3 weeks after No. 5.	Bordeaux, 4-4-50, and 2 lbs. arsenate of lead.

## PECANS

Pest or Disease.	Time to Spray.	Material and Strength.
(1) Nut case bearer.	When first larvae are seen after nuts are set.	3 lbs. arsenate of lead to 50 gals. water.
(2) Nut case bearer.	Two or three additional applications at intervals of 7 to 10 days.	Same as No. 1.
(3) Obscure scale.	Dormant season.	Oil emulsion.
(4) Scab.	After growth starts and during warm humid weather.	Bordeaux, 4-4-50.
(5) Webb worms.	When first appear.	2 lbs. arsenate of lead to 50 gals. water.

## GRAPES

Pest or Disease.	Time to Spray.	Material and Strength.
(1) Black rot, mildew.	After leaves have fallen and before growth starts in the spring.	Bordeaux mixture, 4-4-50.
(2) Black rot, mildew, biting insects.	When leaves are out 4 to 6 ins.	Bordeaux, 4-4-50, and 2 lbs. arsenate of lead.
(3) Black rot, mildew, biting insects, sucking insects.	10 days to 2 weeks after No. 2.	Bordeaux, 4-4-50, 1 lb. arsenate of lead and ½ pt. nicotine sulphate.
(4) Black rot, mildew.	2 weeks after No. 3.	Bordeaux, 4-4-50.
(5) Black rot, mildew.	2 weeks before harvest if necessary.	Bordeaux, 4-4-50.

## PEACHES, PLUMS AND APRICOTS

Pest or Disease.	Time to Spray.	Material and Strength.
(1) a. Peach leaf curl alone. b. San Jose and other scale.	After leaves have fallen and until growth starts in the spring.	a. Bordeaux, 4-4-50. b. Oil emulsion.
(2) Brown rot, curculio, scab, biting insects, leaf spot.	When two-thirds of the shucks are off.	Self-bolled lime-sulphur, 8-8-50, or wettable sulphur, and 2 lbs. arsenate of lead.
(3) Brown rot, curculio, scab, leaf spot, biting insects.	7 to 10 days after No. 2.	Same as No. 2.
(4) Brown rot, scab, leaf spot.	About 4 weeks before ripening.	Self-bolled lime-sulphur or wettable sulphur.
(5) Borers.	October 1 to 15 and March 1 to 15.	Paradichlorobenzene (see U. S. Dept. Agr. Bul. No. 1169).
(6) Borers.	Fall and winter.	Diz worms out.

## CITRUS

Pest or Disease.	Time to Spray.	Material and Strength.
(1) Scale insects.	December and January.	Oil emulsion.
(2) Red spider, thrip, rust mite.	When two-thirds of petals have fallen.	3 qts. lime-sulphur to 50 gals. water and 6½ oz. nicotine sulphate.
(3) Scale insects, rust mite, red scale.	When fruit is about 1 in. in diameter.	Soda sulphur (see F. R. 933), 1 to 50 and 3 qts. oil emulsion.
(4) Rust mite, red spider.	10 to 14 days after No. 3.	Lime-sulphur, 3 qts. to 50 gals. water, or dust with sulphur.
(5) Scale insects, rust mite, red spider.	July or August.	Same as No. 4.

## FIGS

Pest or Disease.	Time to Spray.	Material and Strength.
(1) Rust.	January.	Bordeaux, 4-4-50.
(2) Rust.	Just after growth starts and repeat every 3 or 4 weeks as needed.	Bordeaux, 4-4-50.

## Aeroplane Dusting of Fruits

By Monroe McCown  
Indiana Horticultural Society



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# ATKINS SILVER STEEL SAWS

ON JULY 31, 1925, an apple orchard at Mitchell, Ind., was dusted by an aeroplane. The aeroplane swooped down upon the orchard and belched forth a ribbon of dust which quickly formed into a cloud and slowly settled to earth, where it enveloped the trees and drifted across the orchard. This is not the usual method of pest control employed in the orchards of the Burton Fruit Company or anywhere else in the state of Indiana. It was a demonstration of aeroplane dusting conducted by the Morse Agricultural Service of New York at the time of the summer meeting of the Indiana Horticultural Society.

#### Apparatus Used and Principles Involved

A few words regarding the apparatus used and the principles involved in aeroplane dusting should not be amiss.

The early types of apparatus used in aeroplane dusting were very crude. Allan L. Morse describes the first model as fol-



The back lash from the propeller drives this windmill that pumps the air into the hopper

lows: "The first duster consisted of a flat tank with a hand driven paddle-wheel agitator at the bottom just in front of a sliding gate valve. The tank hung over the side of the fuselage and the operator pulled open the gate valve and cranked vigorously. The powder fell out into the air and was whipped into a cloud by the propeller blast. The main disadvantage of this type was that it required an extra man in the aeroplane to operate it and the aeroplane could carry only 100 pounds of dust at a time. Moreover, the rate of feed depended upon the speed with which the operator cranked, and uniform results were impossible."

The equipment used by Mr. Morse is of his own invention. It consists of a large metal hopper, a small windmill driven air pump and a venturi or distributing tube. The hopper fits in the fuselage of the aeroplane. The compressed air pump is fastened to the hopper and forces air through small tubes into the hopper. This air in the hopper agitates and fluffs up the powder, thus insuring an even flow of dust into the venturi tube. The venturi is a tube open at both ends. The forward end is constricted to form a "throat" and the other end is flaring. The venturi is attached to the bottom of the hopper and fits underneath the fuselage. The pilot releases the dust into the venturi by means of a lever.

When the powder drops into the venturi it is caught in the propeller blast and blown out into the down cur-

rents caused by the passage of the wings through the air. These down currents form the dust into a cloud and carry it to the ground as such.

#### Dust Sticks by Static

At some point in its journey from the hopper to the plant each dust particle is supposed to acquire a positive charge of static electricity, by virtue

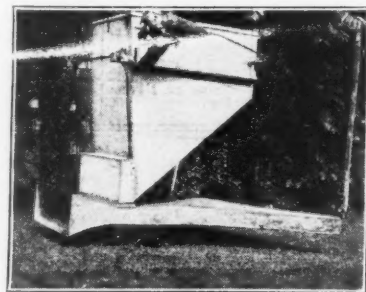
of which it sticks to the foliage. The plant carries a negative charge. Mr. Morse explains it thus: "The aeroplane in the air is electrically insulated from the earth, and since there is a great deal of friction of the air and powder in the distributing apparatus, the powder is given a charge of static electricity which is of opposite sign to that carried by the earth. This causes the powder to stick. Faint indications of such a condition were obtained through the use of electroscopes in the field." He further stated that penetrability of the dust discharged by an aeroplane was tested in the following manner: "A particularly dense portion of cypress swamp was chosen and some small glass plates were placed well in under the foliage. At that point the foliage was so thick that only 10 per cent of the sunlight ever found its way through. After the dusting aeroplane had made one trip over the treetops, the plates were found to be covered with powder."

To my own knowledge, the demonstration at Mitchell was the first instance where an aeroplane was ever used in dusting an apple orchard. Much experimental work has been carried on in other lines of agriculture. J. S. Houser of the Ohio Agricultural Experiment Station first conceived the idea of employing the aeroplane for dusting purposes. In 1921 a catalpa grove near Cleveland, Ohio, was dusted

was tried in peach orchards in Georgia, then followed this demonstration at Mitchell, and on August 27 a demonstration was conducted by Mr. Morse at Pemberton, N. J., testing its possibilities as a weapon in combating cranberry diseases.

#### Future Value to Orchardists

Due to its recent entrance into the field of horticulture, it is too early to predict what the future value of aeroplane dusting will be to the orchardist. However, the aeroplane can become of practical value to the orchardist only when dusts and dusting schedules have become so perfected that the more important insect pests and diseases can be satisfactorily controlled by the use of dust. After this has been accomplished, the aeroplane must do the work as cheaply as ground machines. The last prerequisite necessitates large acreages, not necessarily in single blocks, but the individual orchards must be reasonably close together. This condition can be found



The quickly detachable dusting apparatus is assembled outside the aeroplane

only in the large producing sections of the country.

A man visiting a country town in Maine went to the local barber shop for a shave. The barber made several slips with his razor and each time he would paste a small piece of paper over the cut to stop the bleeding. When the operation was over the victim handed the man a dollar. "Keep



Following the aeroplane, a dust cloud envelops the trees and slowly drifts across the orchard

for control of the catalpa sphinx. Since then aeroplane dusting has been tried on various crops, but this past season marked its entrance into the field of horticulture. Earlier in the summer it

the change, barber," he said. "It is worth a dollar to be shaved by so versatile an artist. Why, man, you're a barber, butcher and paper-hanger, all in one."—Er.



## A Grower's Dusting Experience

By C. L. Burkholder  
Purdue University

MANY commercial growers are watching and reading all they can about the use of dust in place of liquid sprays in the yearly battle against orchard insects and diseases. Along this line, the experiences of D. B. Johnson of Mooresville, Ind., are both interesting and instructive. Mr. Johnson has been using a duster for at least a portion of his orchard each season for a number of years. At first the dust was applied to apples in accordance with the liquid spray schedule. Dust applied in this manner, however, did not give satisfaction, and Mr. Johnson tried both sulphur and copper dusts on this schedule.

In the spring of 1924 Mr. Johnson decided to give the dust one more trial, but he made up his mind to make an application every week, using a sulphur dust. This every week program was strictly adhered to up until August 1. Every Monday morning a weather survey was made at day-break. If the wind was absolutely still, the duster was pulled into the orchard. If there was the least wind stirring, it meant another two hours' snooze and another weather survey Tuesday morning. In a few instances the dusting was done at night with the aid of auto headlights and a storage battery, which was rented at 25 cents per night.

About one pound of dust was used per tree in each weekly application. It was applied from one side of the row only. The following week the dust was put on from the opposite direction. Trees were large and in some cases pretty high.

In the summer and fall of 1924, Mr. Johnson harvested the cleanest crop of apples he had raised in years, as far as scab, curculio and codling moth were concerned. Apple blotch on some varieties was not controlled satisfactorily. Mr. Johnson says, "I would recommend liquid Bordeaux sprays 10 days, four weeks and six weeks after the petal fall for varieties which are known to be susceptible to blotch." The only apple scab of any consequence was in the tips of a few of the tallest trees, especially White Pippin, which is very susceptible to this disease.

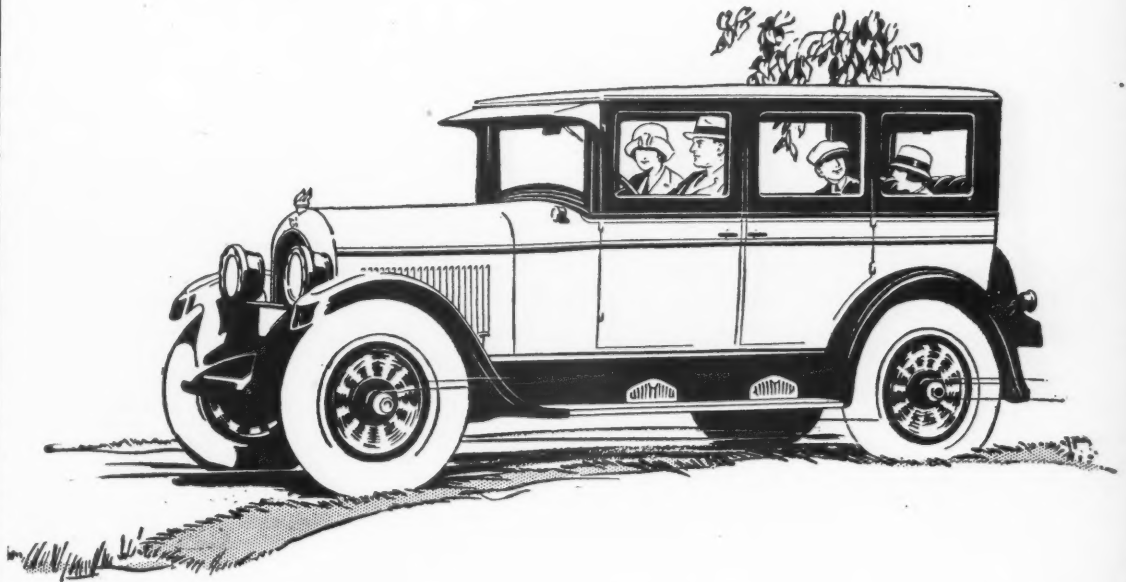
Weather conditions were very favorable to the development of scab in the spring of 1924. While no check trees were left, the tips of the tall trees which the dust failed to reach were a good indication at least of what might have been expected.

In 1923 a peach dusting schedule, applied the same as for liquid sprays, on 30 acres of peaches in the Johnson-Hobbs orchards resulted in an exceptionally clean crop of peaches. The season was not a favorable one for the development of scab and brown rot, but Mr. Johnson feels that it will prove to be a much better way to handle summer disease and insect control in the peach orchard than the former methods of liquid spraying.

There is much that can be said and remains to be learned about dusting. Evidently, however, the size and topography of the orchard, as well as the important diseases and insect enemies of each section, all have a bearing on the practicability of dusting as a substitute or supplement to liquid spraying. In very large orchards requiring three or more sprayers a duster often comes in handy when rainy weather puts the work behind, or mid-summer shortages of water increase the labor of liquid spraying. Some growers say, "It is enough to work all day without dusting all night in addition." Others don't like the idea of starting the day's work at three a. m. Still others say they prefer to work all of one night in place of having a nasty four-day job with the liquid outfit. Mr. Johnson belongs to the last class.

The best way to prevent a man from cutting his fingers off while chopping kindling is to get his wife to chop the kindling.

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# CHRYSLER "58"

# Spraying and Dusting Schedules for Michigan

By W. C. Dutton, Michigan Agricultural College

In these schedules, recommendations are made for spraying and for dusting. The value of the spraying materials recommended has been well established in every instance, and satisfactory control may be expected if the materials are used at the proper strength, properly mixed, and applied thoroughly at the correct time. The value of dusts under Michigan conditions has been well established for certain uses, but with some fruits the results have not been consistently satisfactory in seasons which were very favorable for the development of diseases and insects. Complete dusting schedules are given, however, wherever possible to guide the growers who

care to use this method of application. Some growers use a combination of both methods. The usual procedure in such cases is to spray for all applications before the blossoming period and to dust for all or part of them after the blossoming period. Dusting may also be used to advantage as an auxiliary to spraying to cover the orchard quickly under emergency conditions or to dust when conditions are not favorable for spraying applications. In some sections and with certain varieties all the applications indicated may not be required. Make changes only when infestation is light or with resistant varieties.

## APPLES

Application.	To Control.	Spraying. Materials	Dusting.	Remarks.
Dormant. Apply as late as possible before growth starts; or—	Scale insects.	Liquid lime-sulphur, 12½ gals. in 100.	Same as for spraying.	There are certain proprietary sulphur sprays which usually give satisfactory results if used strong enough. Use this application when scale insects only are present.
Delayed dormant. Begin when the fruit buds show silvery and finish when they are in the "squirrel's ear" stage.	Aphids and scale insects.	Liquid lime-sulphur, 12½ gals. in 100, plus nicotine sulphate (40%), 1 pt.	Same as for spraying.	This is the safest method of attack on aphids and will at the same time control scale if present.
Pre-pink. Should start soon after "squirrel's ear" stage but should be finished when the buds show in a compact cluster and with leaves turned back from them, but before any separation occurs.	Scab.	Liquid lime-sulphur, 2½ gals. in 100.	Sulphur dust.	This application is very important with most varieties and is especially desirable with the dusts.
	Bud-moth.	Lead arsenate powder, 2 lbs. in 100 gals.	Or 90-10 sulphur-lead dust.	If bud-moth is present use lead arsenate in either the spray or dust.
Pink. Apply as soon as possible after the buds separate in the cluster but before any blossoms open.	Scab, green fruit worm, cankerworm and other chewing insects.	Liquid lime-sulphur, 2½ gals. in 100, plus lead arsenate powder, 2 lbs.	90-10 sulphur-lead dust.	With dusting treatment, an extra application of sulphur dust should be made between the pre-pink and pink in seasons when development is slow during that period. If aphids have not been controlled completely, use nicotine. Red-bug will also be controlled by the nicotine. An extra application of nicotine-lime dust may be made in addition to the 90-10 sulphur-lead dust.
	Aphids, red-bug.	Nicotine sulphate (40%), 1 pt. in 100 gals.	Sulphur-lead - nicotine dust.	
Calyx. Apply as soon as most of petals are off.	Scab, codling moth, other chewing insects.	Liquid lime-sulphur, 2½ gals. in 100, plus lead arsenate powder, 2 to 3 lbs.	90-10 sulphur-lead dust.	This should be completed as soon as possible after the petals fall. If red-bugs are present, use nicotine.
	Red-bug.	Nicotine sulphate (40%), 1 pt. in 100 gals.	Sulphur-lead - nicotine dust or separate application of sulphur-lead and nicotine-lime dusts.	
Ten days or 2 weeks. Should be completed in 2 weeks after petal-fall.	Scab, codling moth, other chewing insects.	Liquid lime-sulphur, 2½ gals. in 100, plus lead arsenate powder, 2 to 3 lbs.	90-10 sulphur-lead dust.	For spraying, this may be delayed 1 to 2 weeks if scab control has been completed earlier; otherwise, begin on tenth day. With dusting, this application should be split. Dust one side of trees 1 week after petal-fall and complete at 2 weeks.
Thirty days. Should be complete about 30 days after petal-fall.	Codling moth, scab.	Liquid lime-sulphur, 2½ gals. in 100, plus lead arsenate powder, 3 lbs.	85-15 sulphur-lead dust.	If the previous spray application has been delayed this may be omitted; otherwise, it is desirable for codling moth control. The dust application should be split, as before, dusting one side at about 3 weeks and completing at 30 days. The first half should be made on same side of trees as first half of previous dusting.
Second brood. Exact time to be determined. Usually about first week in August.	Codling moth, scab.	Liquid lime-sulphur, 2½ gals. in 100, plus lead arsenate powder, 3 lbs.	85-15 sulphur-lead dust.	The exact time for this application is determined each year by the Experiment Station Entomologist.

## PEARS

Application.	To Control.	Spraying. Materials	Dusting.	Remarks.
(1) Dormant. Apply just as the buds begin to swell; or—	Scale insects and blister-mite.	Liquid lime-sulphur, 12½ gals. in 100.	Same as for spraying.	This application may be used when scab and psylla are not present.
(1-a) Delayed dormant. Apply after the buds can be seen in the cluster, but application must be completed by the time they begin to separate.	Psylla, scab, scale insects and blister-mite.	Liquid lime-sulphur, 12½ gals. in 100.	Same as for spraying.	This application is very important for the control of scab and at the same time will control scale and blister-mite.
(2) Pink (cluster stage). Apply as soon as possible after the buds separate but before the blossoms open.	Scab.	Bordeaux, 4-8-100.	Sulphur dust.	This is necessary only in districts where scab is prevalent or on varieties that are always susceptible to scab.
(3) Calyx (petal-fall). Apply just after the petals have fallen.	Psylla, scab, codling moth.	Bordeaux, 4-8-100, plus lead-arsenate powder, 2 lbs., plus nicotine sulphate (40%), 1 pt.	90-10 sulphur-lead dust and nicotine-lime dust (2 to 3% nicotine).	A very important application for the control of psylla. When dusting, the nicotine application must be delayed for 7 to 9 days and made separately. Nicotine dusts do not seem to be as certain a control for psylla as proper spraying but have given fairly satisfactory results in some parts of the country.
(4) Two weeks. Apply 2 weeks after the petals have fallen.	Psylla, scab, codling moth.	Bordeaux, 2-8-100, plus lead arsenate powder, 2 lbs., plus nicotine sulphate (40%), 1 pt.	90-10 sulphur-lead dust and nicotine-lime dust (2 to 3% nicotine).	The nicotine dust must again be delayed until about 2 weeks after the first application of nicotine dust. If necessary to spray for scab and worms only, the nicotine should be omitted from both dust and spray.

SPECIAL NOTE—The spraying or dusting requirements for pears vary widely in different parts of the state. Each grower must spray according to local conditions. The following lists will serve as a guide:

1. If necessary to spray for scale and blister-mite only, use application No. 1.
2. If necessary to spray for scab alone, or in addition to scale and blister-mite, use applications Nos. 1a, 2, 3 and 4, but omit nicotine.
3. If necessary to spray for scab and psylla alone, or in addition to scale and blister-mite, use applications Nos. 1a, 2, 3, and 4. Use all materials indicated.

4. If necessary to spray for psylla alone, or in addition to scale and blister-mite, use applications Nos. 1a, 3 and 4. For this schedule (when scab is not present) the strength of the Bordeaux may be reduced to 2-8-100 for both Nos. 3 and 4. When spraying for psylla, very thorough application is necessary. Spray from the ground. Use a fine driving spray with high pressure. Cover every portion of the tree. For the summer applications, spray up through the center clear to the top, drenching every leaf, stem, fruit and bud.

## PEACHES

Applications.	To Control.	Spraying. Materials	Dusting.	Remarks.
Dormant. Apply in early spring before buds begin to swell.	Leaf-curl, scale.	Liquid lime-sulphur, 12½ gals. in 100.	Same as for spraying.	This application must be made before growth starts in the spring. A fall application made after the leaves drop is generally effective in the control of leaf-curl.
After the blossoms have dropped and most of the "shucks" have fallen.	Curculio.	Lead arsenate powder, 2 lbs. in 100 gals., plus 2 to 3 lbs. lime (lump or hydrated).	Lead arsenate—hydrated lime dust (10% lead arsenate).	This application may be omitted if curculio is not serious.
Two weeks after the "shucks" have fallen.	Curculio, scab, brown-rot.	Dry-mix sulphur-lime spray, plus lead arsenate powder, 2 lbs.	80-10-10, sulphur-lead-lime dust.	This is more necessary in areas where rot or scab are likely to develop.
About one month before the fruit ripens.	Brown-rot, scab, curculio.	Dry-mix sulphate lime spray plus lead arsenate powder, 2 lbs.	60-10-10, sulphur-lead-lime dust or sulphur dust.	This is important where brown-rot or scab are likely to develop. If curculio is not serious, the poison may be omitted.
One week to 10 days before fruit is picked.	Brown-rot.	Sulphur-calcium spray (16 lbs. sulphur, 1 lb. calcium caseinate. Mix dry, add water to make thin paste and dilute to 100 gals.)	Sulphur dust.	This application is very important with many varieties to retard the development of rot after picking and packing.

(Concluded on page 22)

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DEALERS EVERYWHERE**

# Spraying and Dusting Schedules for Michigan

(Continued from page 20)

## GRAPES

Application.	To Control.	Materials		Remarks.
		Spraying.	Dusting.	
When shoots are 8 to 10 ins. long.	Black-rot and downy mildew.	Bordeaux, 8-8-100.	Copper dust (20% mono-hydrated copper sulphate).	
Just before the blooming period.	Black-rot, berry-moth, downy mildew and rose-chafers.	Bordeaux, 8-8-100, plus calcium arsenate, 2 lbs., or lead arsenate, 3 lbs.	Copper dust (20%), with 10 to 15% calcium or lead arsenate.	If rose-chaffer is present, add more arsenical.
Just as the blossoms are falling.	Black-rot, berry-moth, downy mildew and rose-chaffer.	Bordeaux, 8-8-100, plus lead arsenate, 3 lbs., or calcium arsenate, 2 lbs.	Copper dust (20%), with 10 to 15% calcium or lead arsenate.	A very important application.
Ten days to 2 weeks after the blooming period.	Black-rot, berry-moth, downy mildew.	Bordeaux, 8-8-100, plus lead arsenate, 3 lbs., or calcium arsenate, 2 lbs.	Copper dust (20%), plus 10% lead arsenate or calcium arsenate if necessary.	The importance of the spray application will depend upon the prevalence of rot and insects. The dust application should not be omitted at this time, but the poison may be left out if not required.
Just before the berries begin to touch in the clusters.	Black-rot, mildew, berry-moth.	Bordeaux, 8-8-100, plus lead arsenate, 2 lbs. or more, plus resin fish-oil soap, 2 lbs.	Copper dust (20%), with 10 to 15% lead arsenate.	This application is very important for berry-moth when it is serious. The leaf-hopper application may usually be made at this time but should be timed according to the development of the nymphs. Spray or dust with nicotine just before the oldest nymphs get wings. If the applications do not coincide, make a special spray of nicotine sulphate and soap. The application of nicotine dust must be made separately under any condition. If hopper nymphs continue to appear, repeat the nicotine application in 1 week to 10 days.
	Leaf-hoppers.	Nicotine sulphate (40%), 1 pt. in 100 gals. Spray upward from below with short rod and angle nozzles.	Nicotine-lime dust (2%).	

## CHERRIES AND PLUMS

Application.	To Control.	Materials		Remarks.
		Spraying.	Dusting.	
Dormant. Apply just before growth starts. This is seldom necessary on cherries.	Scale insects.	Liquid lime-sulphur, 12½ gals. in 100.	Same as for spraying.	Sour cherries are seldom affected by scale insects, and sweet cherries are affected only occasionally. Make this application only when careful inspection shows it to be necessary.
Petal-fall. Apply soon after the petals have dropped.	Leaf-spot, curculio, brown-rot and slugs.	Liquid lime-sulphur, 3 gals. in 100, plus lead arsenate, 2 lbs. For sweet cherries, use 2 gals. of lime-sulphur.	Copper-lead dust (20% mono-hydrated copper sulphate and 10% lead arsenate).	This should be completed by the time the shucks are falling. Make a complete application of dust to both sides of the trees.
Two weeks. Ten days to 2 weeks after the petals are off.	Leaf-spot, curculio, brown-rot and slugs.	Liquid lime-sulphur, 3 gals. in 100, plus lead arsenate, 2 lbs.	Copper-lead dust. (Same strength as above.)	This should be completed in 2 weeks after petal-fall. Split the application of dust, applying to one side at 1 week and to the other side at 2 weeks.
Four weeks. Complete at 4 weeks after petal fall.	Leaf-spot, curculio, brown-rot and slugs.	Liquid lime-sulphur, 3 gals. in 100.	Copper-lead dust. (Same strength as above.)	For dusting, the application should be split again, alternating from one side to the other to correspond with previous applications. Apply first half at 3 weeks and second half at 4 weeks. Another application of dust (without poison) before harvest may be desirable under some conditions.
One week to 10 days before harvest.	Brown-rot.		Sulphur or copper dust (10 to 15% copper).	On sweet varieties this application is of value in retarding the development of brown-rot just before and after harvest. Dust thoroughly but lightly.
Just after harvest.	Leaf-spot, slugs.	Liquid lime-sulphur, 3 gals. in 100, plus lead arsenate, 2 lbs.	Copper-lead dust. (Same strength as earlier application.)	This is desirable to prevent defoliation during late summer.

**Cherry Aphids**—If the black cherry aphid has been present, spray just before blossoming with nicotine sulphate (40%), 1 pt. to 100 gals., plus 2 to 3 lbs. soap. Drench the trees very thoroughly. Repeat during summer if necessary.

**Plums**—In general, plums are subject to about the same diseases and insects as cherries and require the same type of treatment. Plums are more likely to be affected with scale.

Inspect carefully and spray when necessary. For summer applications use lime-sulphur, 2½ gals. in 100, and increase the amount of lead arsenate if curculio is serious. The applications usually made are: (1) petal-fall; (2) two weeks; and (3) about 1 month before harvest. The application of dust just before harvest is very important with varieties susceptible to rot. For Japanese varieties, do not use liquid lime-sulphur, but substitute dry-mix sulphur-lime spray or sulphur dust.

## New York Society Holds Great Meeting

By C. E. Durst

THE NEW YORK State Horticultural Society, as usual, held one of its great annual meetings at Rochester on January 13-15, inclusive. There were probably 1500 fruit growers in attendance. While the program was excellent in every way, the big feature of the convention was the exhibit of materials and equipment. There is no horticultural exhibit in the country, so far as the writer knows, which compares with that of the New York State Horticultural Society.

The meetings and exhibit were staged at Edgerton Park, which is about two miles from the business section of Rochester. The meetings were held in a large auditorium located in a separate building, thus eliminating all noise and distraction. The exhibit was housed in a large coliseum about 200 yards distant. The main part of this, about 300 by 150 feet, and one of the two wings, about 200 by 100 feet, were entirely filled with exhibits of one kind or another.

### Best Horticultural Exhibit in Country

The fruit exhibit included a large competitive exhibit, an excellent non-competitive exhibit, and an educational exhibit by the New York State Agricultural Experiment Station. A feature of the latter was the display of about 200 varieties of apples in boxes and plates, all correctly named. Another feature of the station exhibit was a series of pictures showing the steps involved in developing a new fruit variety.

The exhibit of machinery and supplies can be best appreciated only by those who saw it. If there were any important manufacturers of spray outfits, spray equipment or spray materials who were not represented by a good exhibit, I have failed to recall

their names. A large number of nurserymen, particularly from New York, had good exhibits. The tractor and the truck people, the plow and cultivator manufacturers, and the garden tractor people were well represented. The makers of packages and of numerous other kinds of equipment and supplies were also there.

Such an exhibit is not built up in one season. It is the result of a far-sighted policy on the part of the officers and directors. Because of this policy, an excellent setting has been developed for the meeting, and the finest spirit of co-operation prevails between the society and the manufacturing interests. Horticultural societies of other states would do well to study the New York methods.

As one might expect, the New York meeting is a mecca for growers interested in the purchase of equipment. Growers were there from many other states besides New York. They paid the closest attention to the equipment, and particularly to new improvements. Many growers who wished to buy equipment attended this meeting so that they might have an opportunity to compare different kinds of equipment.

### Excellent Program

The program included leading horticulturists from New York as well as from many other states. President C. H. McClew deserves credit for beginning the sessions on time and for his able leadership of same. Subjects of outstanding importance received attention. Dr. G. W. Herrick of the College of Agriculture at Ithaca discussed "Some Old and New Insects

with Recent Methods of Control." He stated that while new insects often become serious for a time, they sooner or later are brought under a fair degree of control by artificial means or by the introduction of parasites. He gave some interesting information about the use of sodium fluosilicate for the control of Mexican bean beetles, blister beetles and striped cucumber beetles. These insects eat little and have been difficult to control. The fluosilicate, sprayed or dusted on the plants, does not injure the plants, and yet it irritates the legs of the insects as they crawl over the foliage and fruit. The insects then wipe their feet on their mouth parts, and in this way the material gains entrance into their bodies and kills them. The fluosilicate offers excellent promise in the control of these insects.

A. B. Buchholtz, County Agent of Columbia county, New York, summarized the plant disease situation for 1925. Dr. P. J. Parrott discussed the cottony scale, which has become a serious factor in New York peach orchards. This insect damages the trees by sucking the juices from the bark, and it also secretes a honeydew which supports the sooty fungus, which in turn discolors the fruit. Lime-sulphur, one to eight, has given good results with some growers. In cases where this has been found effective, Dr. Parrott advises the use of three to four per cent oil emulsion, commercial or home-made. The trees should be sprayed thoroughly. This insect is not likely to continue to be of primary importance.

Dr. R. W. Thatcher, Director of the

New York State Agricultural Experiment Station, described experiments on the growing of tobacco for the making of by-products, particularly for spraying purposes. He stated that a wild form (*Nicotiana rustica*) contains much more nicotine than the cigar tobaccos and that the nicotine content can be increased by cultural treatment.

R. B. Wilson of Cornell University stated that arsenical dusts drifting to adjacent clover fields kill many bees. He advised caution in using dusts during clover blooming time, and he suggested dusting at times when drifting would not take place in the direction of clover fields.

Dr. A. J. Heinicke received the closest attention during his address on, "Factors Influencing the Setting of Fruit," in which he reviewed the subject from various standpoints. L. M. Massey stated that fire blight can be controlled by keeping cankers and diseased branches trimmed out and the wounds disinfected.

Dr. R. H. Roberts of Wisconsin occupied an evening session for his address on "Orchard Practice in the Future." In this he discussed chiefly the nutrition of the trees in relation to growth and the setting of fruit buds and fruit.

### Dr. Warren Discusses Economic Problems

Dr. G. F. Warren held the audience two hours one evening while discussing economic problems. He believes that deflation in agriculture has been practically, if not entirely, completed, but he believes that city real estate and labor must still undergo deflation. Price level curves are now following the same tendencies as existed after

(Concluded on page 55)





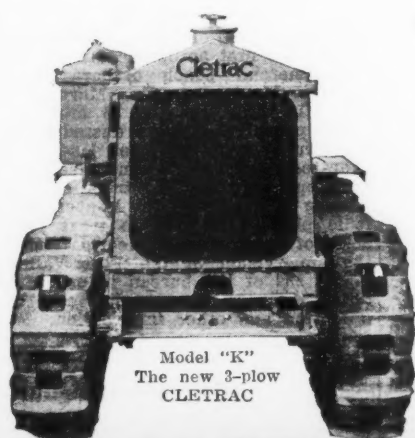
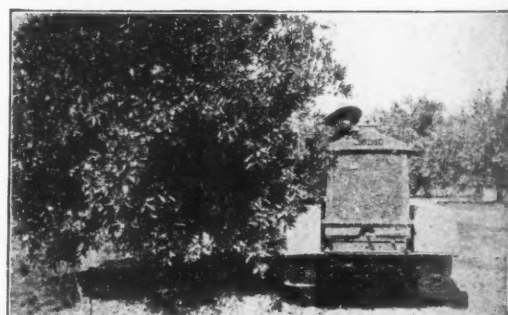
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## Control of Peach Twig Borer by Dormant Spray

ONE OF the most destructive peach pests in some sections is the peach twig borer.

Prunes, nectarines, apricots, and pears are also injured.

The adult moth is dark gray in color, with forewings expanding about one-half inch and marked with darker spots. The full grown larva is about one-half inch long, of a dull reddish-brown color with dark brown or blackish head.

The insect passes the winter as a very small larva in silk-lined cells or burrows in the spongy tissue of the bark at the crotches of the limbs.

Early in the spring, as the foliage is putting out, the larvae begin to leave their burrows and attack the tender shoots, boring into and down the pith, the galleries ranging from about one-third inch to one and one-half inches in length. The shoot injured soon wilts and dies. Many shoots may be attacked by a single larva, which is thus capable of doing considerable harm during the summer. There are two or more generations in a year. The larva may enter the peach at the stem end, and bore into the pit, the seed of which it seems to prefer, usually causing the stone to split, as the fruit ripens; or, simply the flesh may be tunneled, depending on whether or not the stone is hard when the fruit is attacked.

In late summer, the young larvae from the eggs of the last generation of moths construct their hibernation cells in the soft tissue of the crotches of limbs, where they remain until the following spring, thus spending some six months in this condition.

This pest may be controlled by spraying with dormant lime-sulphur sprays after the buds have swollen in the spring. Spraying during the winter with kerosene or distillate-oil emulsion is used by some with good success.

The larvae are readily killed by arsenate of lead at the rate of four pounds to 200 gallons of water, when applied just as the buds are beginning to open.—W. P. Yetter, Jr., Colorado Agricultural College.

## A Practicable Method for Making Bordeaux

NOTWITHSTANDING the many other fungicides used, Bordeaux mixture is still an excellent material for many purposes. In sections where apple blotch is present, it is the best fungicide to use after the young apples have reached the size of marbles. It is a safer material than lime-sulphur to use during hot weather. In the West, it is a good fall spray for peaches, nectarines and apricots. It is a particularly good spray for apricots, which suffer from "sulphur sickness" when lime-sulphur is used.

The construction of elevated platforms for making Bordeaux is costly and the method is more or less troublesome. The making of Bordeaux by having two men pour the dilute mixtures simultaneously into a third receptacle is troublesome and expensive.

There is no doubt but what the best Bordeaux can be made by either of the two methods mentioned, but many growers want a method that is easier to use. For them, the following method is recommended:

1. Prepare the stock solution of blue vitriol by dissolving the material in water at the rate of one pound of vitriol to a gallon of water. Slack the lime carefully and mix with water at the rate of one pound to a gallon of water.

2. Fill the spray tank three-fourths full of water, and start the engine and agitator. Pour in the required amount of vitriol solution. With the agitator running, slowly pour in the required amount of stock lime mixture. If arsenate is to be used, add it at this time.

The Bordeaux made by this method is probably not quite as good as that made by the first two methods mentioned, but the saving in time of making will largely, if not entirely, offset this possible disadvantage. The method certainly results in a better material than is obtained when one dilute mixture is simply poured into the other.

## Coming Horticultural Meetings

ANNUAL meeting Ohio State Horticultural Society, in connection with Annual Farmers' Week Program, Ohio State University, Columbus, Ohio, February 1-5. Secretary, F. H. Beach, Columbus, Ohio.

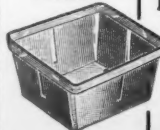
Michigan State Horticultural Society meeting, College of Agriculture, East Lansing, Mich., February 3-5. New Horticultural Building to be dedicated at this time. Secretary, H. D. Hootman, East Lansing, Mich.

Beekeepers' short course, Purdue University, Lafayette, Ind., February 15-18. Address J. J. Davis, Chief in Entomology, Purdue University, Lafayette, Ind.

Joint meeting Berrien County Horticultural Society and Michigan State Horticultural Society, Benton Harbor, Mich., February 24-25. Secretary, H. D. Hootman, East Lansing, Mich.

THE BUREAU of Entomology states that the first aeroplane dusting of a commercial peach orchard took place at Montezuma, Ga., March 23, 1925. In one hour and 55 minutes, 10,000 peach trees were dusted with a mixture of arsenate of lead and hydrated lime. This included the time spent in making trips to the landing field to refill the hopper, etc. It is planned in 1926 to treat 1000 acres of peach trees in Georgia under the supervision of the Fort Valley laboratory of the bureau in order to obtain data on the results, cost of operation and other information.

The QUALITY BASKET

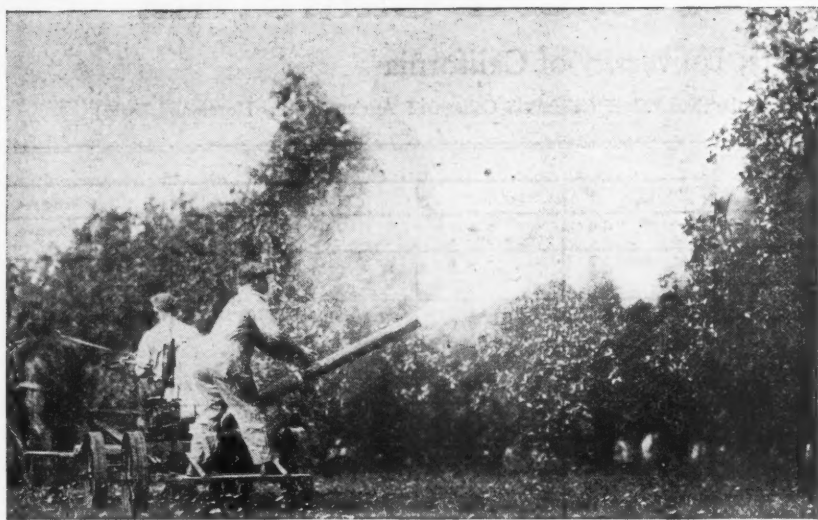


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(The Complete Dormant and Delayed Dormant Spray)

## Crop Protection by Dusting

A Common Sense Talk by

F. L. McDONOUGH  
Crop Pest Specialist

When the orchard needs an application of insecticide or fungicide the present moment is the time to begin making that application and the time to finish that application is just as soon as possible. It takes time to make the application and the larger the acreage to be covered the more time will be involved in getting in and over the crop.

The very shortest time, then, that can be taken to spread a film of pest destroying material over the trees will yield the most protection over that entire orchard. If a grower begins on one side of his orchard to spray and does not get over it for several days, it is obvious that the entire orchard in question cannot have a maximum of protection.

Insect enemies, such as colling moth, will demand tremendous toll in the few days' time that the unprotected portion of the orchard has been exposed to attack. If fungus diseases, such as apple scab, are at work and a rain has occurred during the spraying operation the spores or seeds of the fungus will have sprouted and sent their roots into the leaf tissue. If such is the case, there is no material which can be applied to the plants that will stop this particular infection because diseases of fruit must be prevented and not cured.

The grower must keep a stride ahead of the fungus enemies of the orchard. He must get in and over his crop and lay that film of protection everywhere on the growing surface.

Everyone has seen portions of crops destroyed or damaged by plant diseases where the crops had been treated with spray applications and, supposedly, all in the same way. These failures can be traced to the fact that rain or an infection period had occurred and interrupted the operation of getting over the crop with that film of protective insecticide or fungicide. By the time the grower returned to complete the spraying, infection had taken place or insect enemies had been allowed to do their damage.

If this grower had been dusting he would have been in and over the crop and the time element would have been so reduced as to have made it possible to get the protection on the trees before fungus infection and insect outbreak had the chance to wreak their devastating damage.

In dusting and spraying, essentially the same basic materials are used. The difference lies in the method of application. In dusting, the air is the carrier which forces the insecticide or fungicide to all parts of the trees being treated. Dusting covers four to five times as fast as spraying. Dusting machinery is simple equipment and always ready for use so that a large acreage can often be covered in the time frequently necessary to repair or adjust some portion of a complicated spraying machine.

From the standpoint of time and labor saving, dusting bears the same relation to spraying as the farm tractor hauling the gang plow does to the one-horse draw plow. Frequently, the grower's practice of protecting a crop against its pests amounts to the same thing as a man undertaking to hitch a horse to his farm wagon, driving 25 miles to town and having to be back at the farm in an hour. Of course, this cannot be done. Yet, some growers will try to protect 25 acres when the protection must be brought about in a few hours—and they will take days to do it. Frequently, the first few hours' work only have been effective in protecting the growing crop. However, it is highly possible for a grower to get into an automobile and make a trip of 25 miles in an hour and do it easily. It is equally possible for him to cover the 25 acres in a few hours with a duster and secure protection ahead of the pending fungus infection or insect outbreak.

He cannot make the 25-mile trip with a horse and buggy in an hour. Neither can he spray his entire orchard (when it is needed) in a few hours, but he can dust it in at least one-fourth of the time it takes to do the spraying. Let any grower whose crop has been damaged by apple scab, for instance, consult a Plant Pathologist, he will be told every time that he failed to make the application ahead of the infection which occurred during a certain rainy period. What then is the biggest limiting factor in the control of orchard pests? It is certainly, without argument, TIMELINESS OF APPLICATION.

Are you equipped to get in and over your orchard in time of emergency in the very shortest time possible? If you are not, then, you must certainly be untimely in making the necessary application of insecticide and fungicide in the orchard. With a duster TIMELINESS OF APPLICATION is made four times as easy. In other words, if two men with an equal knowledge of orchard practice—one having a duster and the other a sprayer—the grower who is dusting will have four chances of getting in and over his crop in a timely way while the one who is spraying will have but one.

The grower who is dusting is a four to one favorite over his neighbor who is spraying when it comes to the matter of overcoming the greatest hazard in the production of clean fruit—TIMELINESS OF APPLICATION.

A.F.G. Feb.

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Niagara Sprayer Co., Middleport, N. Y.

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PLEASE FILL THIS IN:

I have.....acres of orchard.....acres of potatoes.....of truck crops.

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Address .....

# Spray Table for Northern California

By Warren P. Tufts, University of California

(NOTE: The following material is largely summarized from Circular No. 227 of California College of Agriculture, by Horne and Essig)

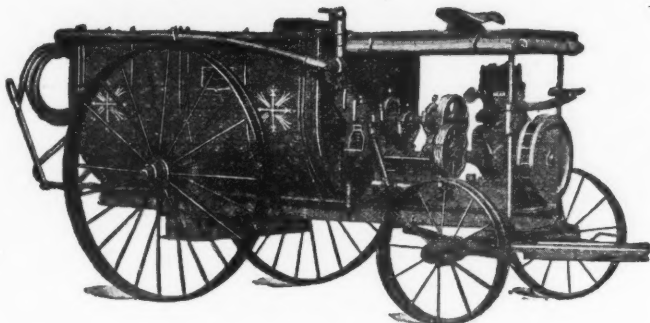
ALMONDS			
What to Spray For.	What to Use.	When to Spray.	Remarks.
Shot Hole.	Lime-sulphur 1 to 10.	Just as buds are swelling.	
Calif. Peach Borer.	See under "Peaches."		
Peach Twig Borer.	See under "Peaches."		
Red Humped Caterpillar.	See under "Prunes."		
Red Spider.	(1) Lime-sulphur 1 to 10 or crude oil emulsion. (2) Lime-sulphur 1 to 50 or sulphur paste 8 to 21 lbs. to 100 gals. water.	(1) During dormant season when trees are leafless. (2) As soon as mites appear and as often as necessary during the summer. Commercial summer oil sprays are very promising.	(1) To kill eggs of the Bryobia. Crude oil emulsion most effective. Distillates and miscible oils not effective. (2) To kill adults of the Tetranychus.
APPLES			
Pear Blight.	See under "Pear."		Spraying ineffective.
Mildew.	Lime-sulphur 1 to 35 or sulphur paste 8 lbs. to 100 gals. water.	When petals fall. Several times throughout the spring.	Sulphur sprays cause injury to apple trees in some sections of California. Cut out all diseased twigs at pruning time.
Scab.	(1) Bordeaux 5-5-50 or lime-sulphur 1 to 20. (2) Lime-sulphur 1 to 35.	(1) As blossoms open. (2) As petals fall.	Later sprayings may be necessary in coastal sections.
Codling Moth.	(1) 2½ lbs. powdered arsenate of lead to 100 gals. water. (2) Same strength as No. 1. (3) 2 lbs. powdered arsenate of lead to 100 gals. water.	(1) As petals fall. (2) Three weeks later. (3) As needed.	In many sections of California 2 sprays are sufficient. In other locations, 4 or 5 sprays are necessary. Watch for new larvae and spray accordingly. Time varies according to locality. Prevent larvae from hibernating about tree trunks and packing house. Destroy wormy apples.
Flat Headed Apple Tree Borer.	Borer only attack sunburned or other dead areas.		Spraying ineffective. White wash trunks to prevent sunburn. Tree protectors more efficient.
Fruit Tree Leaf Roller.	Miscible oil or crude oil spray.	During dormant season, when trees are leafless, to kill eggs.	Thoroughly drench limbs, particularly top and outside branches.
Green and Rosy Apple Aphid.	(1) Lime-sulphur 1 to 10. (2) Nicotine sulphate 1 pt., fish oil soap 4 to 5 lbs., water 100 to 150 gals. (3) 5 or 6% Nicodust.	(1) Late dormant just before buds open. (2) From bursting of the buds until leaf buds are ½ in. long. (3) Same as No. 2.	(1) Fair results in killing eggs. (2) Results in somewhat better control than (1). (3) Dust thoroughly. Community co-operation very important.
Red Humped Caterpillar.	See under "Prunes."		
Scale Insects.	(1) Lime-sulphur 1 to 10. (2) Crude oil emulsion. (3) Distillate emulsion. (4) Miscible oil.	During dormant season, when trees are leafless.	For San Jose scale alone lime-sulphur is sufficient. For a mixed infection of scales use an oil spray; the heavier oils are more efficient.
Tussock Moth.	Destroy egg masses during winter. Jar from trees and prevent reascending by banding trees with cotton wire screen or tanglefoot.		Spraying ineffective.
Woolly Apple Aphid.	Distillate emulsion or miscible oil.	During dormant season when trees are leafless. Paradichlorobenzene in 2 rings about tree is very promising.	For root form open up around trunk and pour in 4 to 5 gals. of spray. Delicious and Northern Spy roots are somewhat immune. See also under "Peach" Calif. Peach Root Borer.
APRICOTS			
Bacterial Gummosis.	Remove infected areas.	Shave off outer bark for some distance and scrape to wood wherever cambium is killed. Use pear blight disinfectant on tools and scarified cankers.	Spraying ineffective. Often branch or tree is killed before much gumming occurs.
Brown Rot.	(1) Bordeaux, 8-50. (2) Bordeaux, 4-50.	(1) When 1/5 of blossoms are open. (2) During full bloom or even after in bad cases if weather continues damp.	During fall and winter remove infected twigs and mummies. Sulphur sprays should be avoided, often causing small fruit.
Shot Hole (Peach Blight).	(1) Bordeaux, 5-50. (2) Bordeaux, 5-50.	(1) After first rains, Nov. 15-Dec. 15. (2) In spring when buds are showing pink.	Bordeaux 2-3-50 as jackets are shed from fruits, in districts where serious.
Brown Apricot Scale.	Crude oil emulsion or distillate emulsion or miscible oil.	During dormant season when trees are leafless, December to February.	Thoroughness of application is necessary. Do not spray before winter rains begin even if that is not before January or February.
Calif. Peach Root Borer.	See under "Peaches."		
Fruit Tree Leaf Roller.	See under "Apples."		
Peach Twig Borer.	See under "Peaches."		
Red Humped Caterpillar.	See under "Prunes."		
CHERRIES			
Bacterial Gummosis.	See under "Apricots."		Spraying ineffective.
Leaf and Fruit Spot (Shot Hole).	See under "Apricots."		
Black Cherry Aphid.	Nicotine sulphate, 1 pt.; fish oil soap, 4 to 5 lbs.; 100 to 150 gals. water, or dust with 5% Nicodust.	As soon as aphids appear.	Dusting must be thorough.
Cherry Fruit Sawfly.	Powdered arsenate of lead, 3 lbs. to 100 gals. water.	When petals are opening.	
Cherry Slug.	(1) Powdered arsenate of lead, 2 lbs. to 100 gals. water. (2) 2 to 5% Nicodust.	When slugs appear.	An easy insect to control.
Pear Thrips.	See under "Pears."		
Red Humped Caterpillar.	See under "Prunes."		
FIGS			
Smut.	No remedy known.		
Souring and Splitting.	Due to unfavorable atmospheric or soil moisture conditions.		
Mediterranean Fig Scale.	Distillate emulsion or miscible oil or crude oil emulsion.	During dormant season.	
GRAPES			
Grape Mildew.	Finest forms of dry sulphur.	When new shoots are 6 in. long, and again just before the blossoms open.	In cool or moist locations a third sulphuring when the grapes are as large as peas and a fourth when two-thirds grown.
Calif. Grape Root Worm.	Powdered arsenate of lead, 3 lbs. to 100 gals. water.	As soon as beetles appear in spring.	Cultivate thoroughly close to vines during winter to kill larvae.
Grape Leaf Hopper.	(1) Nicotine and soap or nicotine sulphate, 1 lb.; liquid soap, ½ gal.; water, 200 gals. (2) Thoroughly dust with 10% Nicodust.	(1) Before young nymphs develop wings. (2) When adults appear.	In place of 10% Nicodust, 6% nicosulphur dust, which will also control mildew, may be used. Also 50% calcium cyanide dust.
Grape Phylloxera.	Use resistant vines. Disinfect cuttings or rootings before planting by dipping in hot water, 122 degrees Fahrenheit for 5 min.		Spraying ineffective.
Mealy Bug.	Difficult to control but best results have been obtained by burning sulphur under a tent over the vines.		
OLIVES			
Olive Knot.	Cut out thoroughly at first appearance and disinfect.		Spraying ineffective. Mission variety is more resistant than the Manzanillo and certain other varieties.
Black Scale.	See under "Apricots."	Use distillate emulsion or miscible oil—weaker than for deciduous trees.	
PEACHES AND NECTARINES			
Peach Blight.	(1) Bordeaux, 5-50. (2) Lime-sulphur 1 to 10.	(1) After first fall rains, Nov. 15 to Dec. 15. (2) Just as buds are showing green in spring.	Peaches cannot be sprayed after leaves appear with these sprays without injury. The fall spray is the most important for blight; the spring spray for leaf curl.
Peach Leaf Curl.			
Brown Rot.	See under "Apricots."		
Powdery Mildew.	See Apple Mildew.		
Black Peach Aphid.	Nicotine and soap or dust with 5% Nicodust.	As soon as insects appear.	
Black Scale.	See under "Apricots."		
Brown Apricot Scale.	See under "Apricots."		
Flat Headed Apple Tree Borer.	See under "Apples."		
Peach Rust Mite.	Lime-sulphur 1 to 10.	During dormant season.	

(Concluded on page 28)



# The "BEAN" Way to Bigger Profits

Better Pest Control Means More "Extra Fancy" Quality



This is the BEAN Giant Triplex, one of the favorites of the BEAN line. It has a capacity of 15 gallons a minute at up to 350 gallons pressure. Has big tank mounted on a drop axle over big wheels for easy hauling. Equipped with BEAN Triplex Pump, BEAN Super-Pressure Regulator, and BEAN 6 h. p. radiator-cooled Engine.

## "BEAN" Sprayers and Dusters are Real Money-Making Partners of the Grower

Clean trees produce the most "Extra Fancy" quality—and it's the "Extra Fancy" that brings in the big profits. The only way to insure clean trees is to spray them regularly and spray them well. Nothing a grower can do pays him so well as to improve his spraying methods.

A better spraying program starts with a better sprayer. You can't do good work with a poor outfit,

or one that lacks the power and capacity for rapid thoro work. When it comes to making an orchard produce a money crop, a good spray outfit is of first importance.

Constant trouble-free service during the critical spraying periods is vital. Continuous full-capacity high-pressure operation is absolutely essential. Only a first class outfit like the BEAN can deliver that kind of dependability.

### 41 Years of Experience Built Into Every Outfit

Since the very beginning of high pressure spraying, BEAN outfits have been on the job—controlling the pests, cleaning up the trees, saving the crops and producing extra profits for the grower.

BEAN built the first high pressure spray pump (with an air chamber) ever used in an orchard—in 1884. And from that day to this BEAN has pioneered the way in the development of better spraying

methods and better spraying equipment. Forty-one years of experience are built into every BEAN outfit—and experience counts!

A good spray outfit must be light. It must be strong. It must be built for long life. It must be simple to operate. It must be easy to keep in order and economical to maintain. The BEAN meets these requirements perfectly at every point.

### All Important Advantages Found in the BEAN

Practically all important improvements in spraying equipment from the first have been developed by BEAN and the BEAN is the only outfit today in which all these important advantages are found in one outfit.

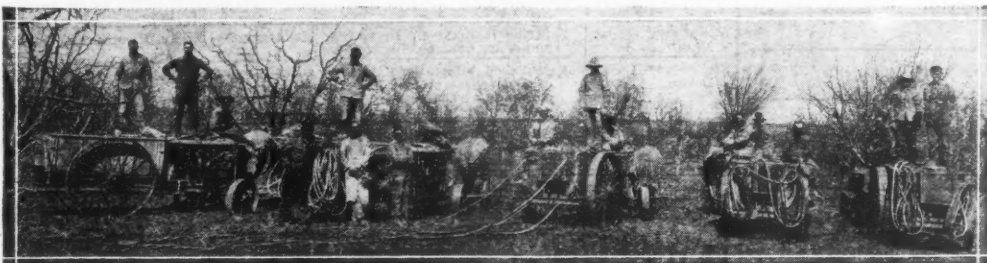
Among the vital features developed by BEAN are the BEAN Pump without stuffing-boxes or stuffing-box troubles; BEAN Permanently Porcelain-lined Cylinders (porcelain-lined on thick cast iron cylinder walls that cannot be damaged); BEAN Troubleless Ball Valves with Threadless cover and removable and reversible seats; BEAN Eccentrics instead of cranks; BEAN Radiator-cooled Engine especially designed for sprayer use; BEAN Suction-feed Air-lift Carburetor, which ends the disadvantages of pump feed;

and BEAN Underneath Suction, which prevents air-lock, allows liquid to flow to pump by gravity, enables you to empty the tank in a few seconds, and makes it possible for you to cut off the liquid from the pump and blow the pump clean in a jiffy.

The BEAN line is complete, including a full range of hand, bucket, barrel, and barrow pumps, as well as power outfits in all sizes from the little Simplicity with a capacity of 5½ gallons a minute at 250 pounds pressure up to the powerful Super Giant, delivering up to 23 gallons a minute at 300-400 pounds pressure.

There is a BEAN to exactly meet your requirements, however large or small your acreage or whatever conditions you have to meet.

Good service and quick and easy access to parts and repairs is assured BEAN owners everywhere thru two complete manufacturing plants (Lansing, Michigan, and San Jose, California); many complete stocks of repairs at various centers; and authorized BEAN dealers in every growing section.



Battery of Bean Sprayers used on the Congdon Orchard, Yakima, Washington, growers of the famous Castle Brand apples. These big orchards must have the best in spraying equipment—hence, their choice of the BEAN.

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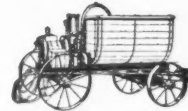
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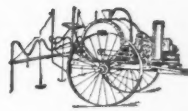
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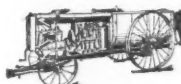
Bean  
"Simplicity"

Capacity of 5½ gallons per minute at 250 pounds pressure sufficient to do good work with a spray gun or supply 2 rods. Furnished with or without truck.



Bean "Universal"

Designed for potatoes and other truck crops, but quickly converted into an orchard sprayer. Adjustable to any rows.



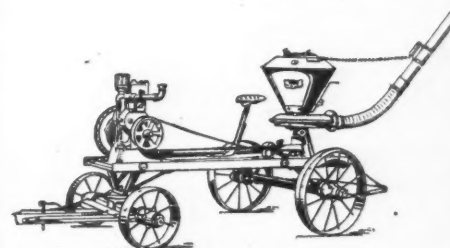
Bean  
"Super Giant"

A real giant for work. Capacity up to 23 gallons a minute at 300-400 pounds pressure. For large acreages and where very rapid high pressure work is required.



Bean "Junior"

Best low-priced hand pump made for spraying, white-washing, etc. Simple, easy to operate, and especially adapted for use with tank or barrel.



## BEAN Crop and Orchard Power Dusters

The grower whose conditions are such that he desires to dust as part of his pest control program, will find the BEAN Power Duster a thoroughly efficient, economical, and satisfactory outfit for doing the work.

### Mixes Its Own Dust

The BEAN handles any factory made materials easily, and it can mix these various combinations right in its own hopper and then immediately apply them. The advantages of this self-mixing feature are many—

It cuts the cost of material in half.  
It insures fresh and more active dust.  
It insures the proper percentage to suit the conditions.

It insures the needed materials when they're needed.

It insures application of dust at exactly the right time.

It insures most economical use of material, as mixtures need not be carried over from one season to another (thus losing their strength and value).

### Insures Thoro Coverage

With the BEAN you get a better job of dusting because the material is not only well broken up in the hopper, but passes from the hopper directly into the fan where it is made still finer and forced out at high velocity in an all-enveloped dust cloud that gives complete coverage and best possible results.

The BEAN is simple in design, having but one shaft and one belt. No gears, chains, or complicated parts.

Built in 2-wheel type for truck crops and 4-wheel type for orchards and vineyards. Both types equipped with BEAN 4 h. p. or 6 h. p. Engine with Wico magneto and both completely guaranteed.

Write for Special Duster Folder

# Spray Table for Northern California

(Continued from page 26)

## PEACHES AND NECTARINES—Continued

What to Spray For.	What to Use.	When to Spray.	Remarks.
Calif. Peach Root Borer.	Spraying ineffective. Use 1 oz. paradichlorobenzene to the tree, spreading in a ring around the trunk, being careful to keep the material 3 in. from the trunk of the tree. Cover with 5 in. of soil mounding around trunk.	This remedy should be applied in the early fall before the ground becomes moistened.	Spraying ineffective. Increase the dosage for very large trees.
Peach Twig Borer.	Lime-sulphur 1 to 10.	As blossom buds begin to open.	Addition of 3 lbs. powdered arsenate of lead per 100 gals. increases effectiveness.
Red Spider.	See under "Almonds."		
San Jose Scale.	See under "Apples."		
Wheat Thrips.	See under "Pears."		Cover crops increase wheat thrips.

## PEARS

Black End.	No remedy known. Give good care especially as to drainage.		In many cases lack of sufficient moisture may possibly be cause.
Blight.	Spraying ineffective. Cut out all affected parts thoroughly. Especially remove all "holdover" in limbs, trunk and roots during the winter. Disinfect tools and cuts freely; mercuric cyanide and corrosive sublimate 1 part of each to 500 of water in a mixture consisting of 3/4 glycerin and 1/4 water. In future plantings, topwork on resistant stocks.		New cankers in which cambium is not injured may be arrested by paring off the outer bark very thoroughly and applying the disinfectant. Large branches may usually be saved.
Scab.	Lime-sulphur 1 to 12 or Bordeaux 5-50.	(1) Just as cluster buds are opening. (2) Repeat when first blossoms are opening.	Later sprays may be necessary in moist localities.
Brown Apricot and other soft scales.	See under "Apples."		
Cherry or Pear Slug.	See under "Cherries."		
Codling Moth.	See under "Apples."		
Fruit Tree Roller.	See under "Apples."		
Green Apple Aphid.	See under "Apples."		
Italian Pear Scale.	Crude oil emulsion or distillate emulsion or miscible oil.	During dormant season, January or February.	Crude oil emulsions are best. Thoroughly drench limbs and trunks.
Pear Leaf Blister Mite.	Lime-sulphur 1 to 10.	November or February.	In most sections the November or early December spray gives greater control than the February spray.
Pear Root Aphid.	See under Woolly Apple Aphid under "Apples."		Calleryana pear root is more resistant to this pest than the French pear root.
Pear Thrips.	Distillate emulsion 10 gals.; nicotine, 1 pt.; water to make 200 gals. Or dust with 5 or 6% Nicodust repeatedly.	As soon as "black" thrips appear in the blossoming buds as the latter begin to open. Spray as often as necessary.	Carefully watch buds for infestation prior to opening. Winter cover crops help to hold adults in ground if not plowed under till after blossoming is through.
Red Humped Caterpillar.	See under "Prunes."		Treatment for the Italian pear scale will also control San Jose Scale.
San Jose Scale.	See under "Apples."		

## PLUMS AND PRUNES

Brown Rot.	See under "Apples."		Not often serious.
Scale Insects.	See under "Apples" and "Apricots."		
Calif. Peach Root Borer.	See under "Peaches."		
Cherry Fruit Sawfly.	See under "Cherries."		
Citrus Red Spider.	See Red Spider under "Almonds."		
Flat Headed Apple Tree Borer.	See under "Apples."		
Fruit Tree Leaf Roller.	See under "Apples."		

## PLUMS AND PRUNES—Continued

What to Spray For.	What to Use.	When to Spray.	Remarks.
Italian Pear Scale.	See under "Pears."		
Mealy Plum Louse.	6 lbs. fish oil soap to 100 gals. of water.	When insects appear in May and June.	Spraying must be done promptly before leaves are curled. The soap spray appears to give satisfactory results and is cheaper than the nicotine soap spray.
Peach Twig Borer.	See under "Peaches."		
Pear Thrips.	See under "Pears."		
Red Spider.	See under "Almonds."		
Red Humped Caterpillar.	(1) 5 lbs. powdered basic arsenate of lead, water 100 gals. (2) Dust with dry arsenate of lead, diluted with powdered hydrated lime.	Whenever insects appear. Young caterpillars are much easier to kill than larger ones.	This pest is difficult to control. Close hoeing around trunks of trees during fall and spring will kill many hibernating larvae.
Tussock Moth.	See under "Apples."		

## WALNUTS

Blight.	No specific remedy. Plant resistant varieties.		
Codling Moth.	See "Apples." (1) Basic arsenate of lead 3 lbs. to 100 gals. water. (2) Or dust with powdered arsenate of lead and hydrated lime.	When the work of the insect is first observed in May and July.	Time of application depends upon climatic conditions.
Red Humped Caterpillar.	See under "Prunes."		
Walnut Aphid.	Dust thoroughly with 2% Nicodust.	Last week of May or first part of June.	Sometimes second application is necessary in July or August.
Walnut Blister Mite.	Lime-sulphur 1 to 10.	When buds are swelling in spring.	Not a serious pest.

## BUSH FRUITS (Blackberries, Loganberries, Raspberries)

Leaf Spot.	(1) Bordeaux, 5-50. (2) Lime-sulphur 1 to 10.	During dormant season.	Cut out and burn infected parts in fall. Renew old plantings. This disease sometimes confused with anthracnose which has not yet been identified in California.
Cane Blight.			
Orange Rust.	Cut off diseased plantings below surface of the ground and burn. Bordeaux spraying is to prevent infection of healthy plants.		
Raspberry Horn-tail.	Spraying ineffective. Cut off wilted tips as soon as noticed and burn. Remove all dead canes in winter, using care to dig out the borers at that time.		
Rose Scale.	Distillate emulsion or miscible oil.	During dormant season.	Prune out old canes every year. Pest only serious where pruning is not regularly practiced.
Red Berry (Blister Mite).	Lime-sulphur 1 to 12.	When growth starts in spring.	Attacks only Giant Himalaya.

## CURRENTS AND GOOSEBERRIES

Mildew.	Lime-sulphur 1 to 33.	As buds commence to open and two or three times thereafter at intervals of 10 to 14 days.	In California use resistant varieties. Lime-sulphur 1 to 10, followed by a dusting with sulphur when the disease first appears has generally been effective.
Current and Gooseberry Fruitfly.	Spraying ineffective. Cultivate thoroughly during fall, winter and spring months.		
Imported Current Borer.	Spraying ineffective. Cut out and burn all infested canes during the winter and remove the borers.		
Red Spider.	Dust with sulphur or spray with wettable sulphur or sulphur paste.	When insects appear.	

## STRAWBERRIES

Leaf Spot.	Bordeaux 5-50.	During dormant season.	Clean up and burn leaves in late fall. Spraying necessary only in cases where disease is serious.
Strawberry Aphid.	5% Nicodust.	When aphids appear.	Apply dust to under side of leaves. Defoliate plants in fall.
Strawberry Crown Moth.	Spraying ineffective. Be sure of clean nursery stock. Remove and burn infested plants as soon as discovered.		
Strawberry Leaf Beetle.	Established infestations may be reduced by thoroughly spraying with powdered basic arsenate of lead 3 lbs. to 100 gals. of water, or dust with 1 part of basic powdered arsenate of lead to 4 parts of powdered hydrated lime. It is a severe pest and should be eradicated if possible by destroying all infested vines.		
Red Spider.	White lubricating oil emulsions give best results.		

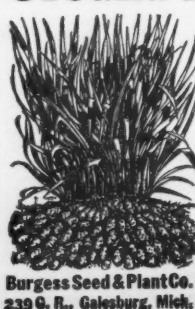
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## Book Review

### Insecticides, Fungicides and Weed Killers

A GOOD book on "Insecticides, Fungicides and Weed Killers" has recently been translated into English from the French. The author is E. Bourcart, and the book is published by Scott Greenwood and Son of London. The American distributor is the D. Van Nostrand Company, 8 Warren Street, New York, N. Y. The price is \$6.

The book is somewhat technical, but nevertheless it can be readily understood by anyone possessing an elementary knowledge of chemistry. The introductory chapters treat the nature of plant parasites, the principles of insect and disease control, and preventative measures. Succeeding chapters take up the numerous materials used for combating insects and diseases. Consideration is given to internal treatment, including use of solutions absorbed by plants, as well as to external applications of materials. The final chapters relate to the use of chemicals for killing weeds, grasses, trees and other plant life.

The subject matter is well condensed and is presented in a practical form. A good index, arranged with reference to the kind of plant, the material used, and the pests treated, is a decided help in assisting one to find what he wants.

### Injurious Insects

"INJURIOUS INSECTS" is the title of a new book that appears at a most opportune time of the year for fruit growers. The author is Glenn W. Herrick, Professor of Economic Entomology at Cornell University. The book is published by Henry Holt and Company of New York.

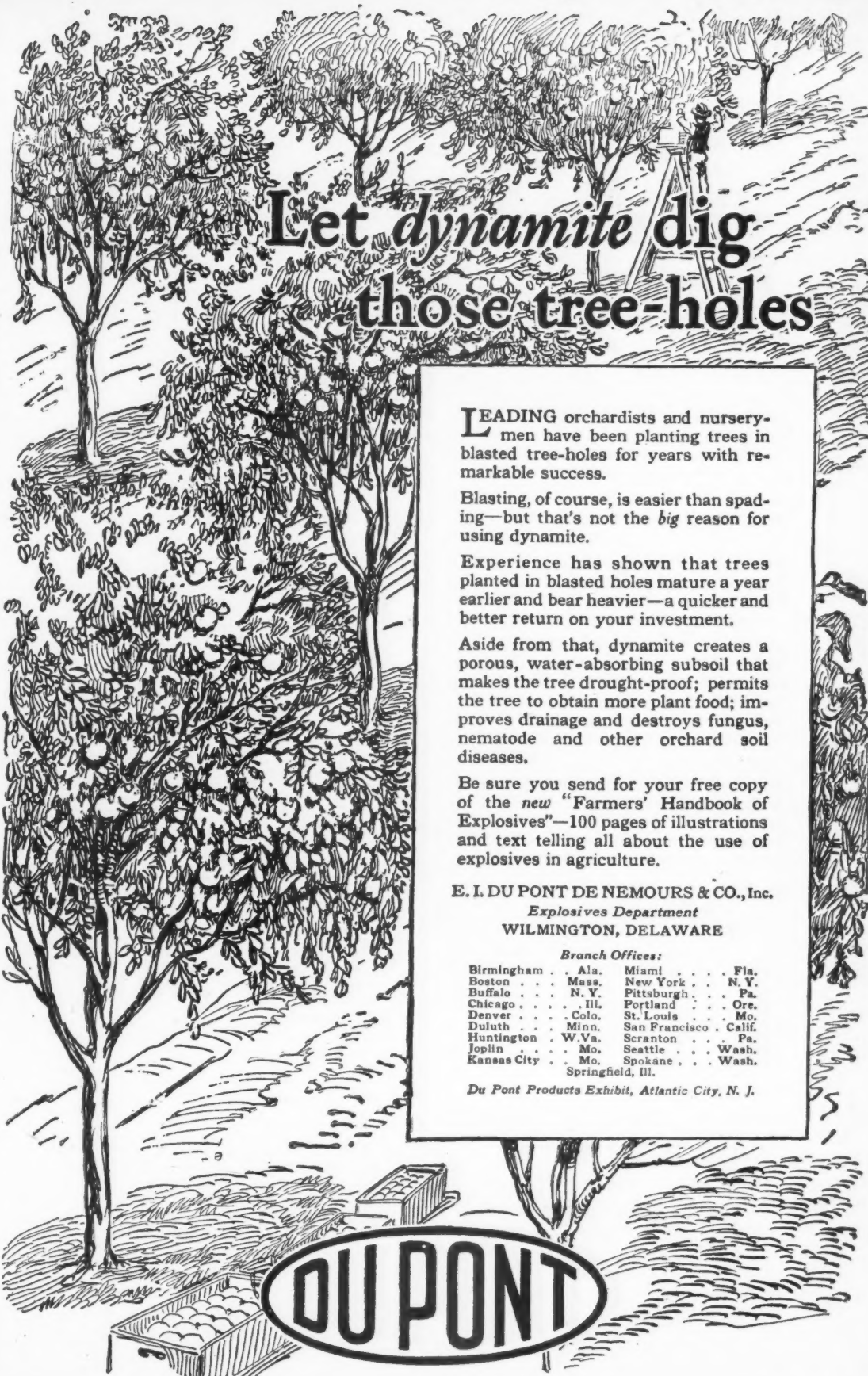
The book summarizes the important information developed to date in regard to the treatment of insects. In the opening chapters it discusses the different forms of insects according to food habits, the damage done by insects, useful insects, materials for controlling the different kinds of insects, and other subjects of general application. Following this, chapters are devoted to insects of the apple, stone fruits, small fruits, citrus fruits, vegetables, greenhouse plants and various other crops. There also are chapters relating to insects of poultry, of livestock and of the household, as well as poisonous insects.

The book is well illustrated, and this helps to make identification of insects easier. There are numerous sub-heads. The arrangement is good and the style is practical in nature. The grouping of the pests under chapters for each important crop or related crops makes it convenient for anyone to determine quickly the identity of any insect. The book will prove a worthy addition to the library of any fruit grower.

### Bush Fruits

THE NEW edition of "Bush Fruits" by Fred W. Card is just off the press. Prof. Card's original book has for a long time been the standard text on bush fruits. The old book has been revised and brought up to date. Certain parts have been eliminated and some others have been modified. The author was formerly connected with the University of Nebraska and he is now located on his own farm in Pennsylvania. This experience has enabled him to prepare a book which is scientifically accurate and which at the same time is written in the language of practical growers. The book is published by the Macmillan Company of New York and sells for \$2.50.

"Chickens, suh," said the old Negro sage, "is the usefulest animal dere is. You can eat dem before dey is born and after dey is dade."



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# Spray Calendar for Southern California

By Robert W. Hodgson, University of California

## TEMPERATE ZONE FRUITS

### APPLES

What to Spray For.	Treatment.	When to Spray.	Remarks.
Codling Moth.	Powdered arsenate of lead.	(1) When most of petals have fallen. (2) Three weeks later. (3) Eight to 10 weeks later.	Thoroughness is the essence of codling moth control.
San Jose Scale.	Lime-sulphur or 2% lubricating oil emulsion.	Dormant season.	
Woolly Aphis. Green Aphis. Peach Aphis.	Nicotine sulphate and liquid whale oil soap, or miscible oil.	As soon as aphids appear in spring.	
Apple Scab.	Bordeaux.	As soon as cluster buds open.	
Powdery Mildew.	Lime-sulphur or atomic sulphur.	In spring.	Combine with (2) Codling Moth spray.

### APRICOTS

Shot Hole Fungus. (Calif. Peach Blight.)	Bordeaux.	Two applications—early fall and when buds are opening in spring.	Before heavy rains (fall).
Brown Apricot Scale.	Miscible oil or oil emulsion.	Dormant season.	
Black Scale.	Bordeaux.	Early fall and during bloom.	Pruning (sanitary) helpful.
Brown Rot.	Self-bolled lime-sulphur.	At fruit setting period.	Very difficult to control.

### PLUMS

Peach Blight.	Bordeaux.	Two applications—early fall and when buds are opening in spring.	
Brown Mite.	Flowers of sulphur dust, lime-sulphur solution or atomic sulphur.	Whenever mites appear.	
Brown Apricot Scale.	Miscible oil or crude oil emulsion.	Dormant season.	
Mealy Plum Louse.	Nicotine.	Just after petals have fallen.	The oil spray for scale may control aphids if applied just after harvest or just before blossoming.

### PEARS

What to Spray For.	Treatment.	When to Spray.	Remarks.
Codling Moth.	Powdered arsenate of lead.	(1) When most of petals have fallen. (2) Three weeks later. (3) Eight or 10 weeks later.	Thoroughness necessary.
Blister Mite.	Lime-sulphur.	At time of leaf fall.	
Brown Mite.	Lime-sulphur solution or atomic sulphur.	When mites appear.	Often dormant oil spray will control mites.
Thrips.	Nicotine.	As the blossom buds are opening.	
Pear Blight.	Spraying not effective.		Thorough pruning only remedy.

### PEACHES

Calif. Peach Blight.	Bordeaux.	Two applications—early fall and when buds are opening in spring.	
Peach Leaf Curl. Twig Borer.	Lime-sulphur solution.	When buds commence to swell.	Dormant spray for blight may be enough.
Scab.	Self-bolled lime-sulphur.	At fruit setting period.	Very difficult to control.

### SMALL FRUITS

Mildew.	Flowers of sulphur dust.	Early in spring.	
Strawberry Leaf Spot.	Bordeaux.	Just before or just after blossoming.	
Aphis.	Nicotine.	Whenever they appear.	
Red Spider (mites).	Sulphur.	Whenever they appear.	

### GENERAL

Peach twig borers attack many of the deciduous trees occasionally. Special spraying for them is seldom practiced. Dormant oil spraying seems to be beneficial in their control.

California peach tree borer may be controlled by use of paradichlorobenzene applied to soil during warm weather.

Woolly aphis attacks both apples and pears, and occasionally other deciduous fruit trees. The aerial forms may be controlled as are other aphids, but the root forms are much more difficult to combat. Paradichlorobenzene and calcium cyanide dust are the best materials available at present.

## SUBTROPICAL FRUITS AND NUTS

### CITRUS FRUITS (Oranges, Lemons, Pomeles).

What to Spray For.	Treatment.	When to Spray.	Remarks.
Scales—Black, Citricola, Red, Yellow, Purple.	Fumigation generally recommended over spraying, but good results are obtained from both miscible and heavy oil sprays.	Soft scales (Black, Citricola)—July to November. Armored scales—all year.	
Red Spider (mites).	Lime-sulphur solution or atomic sulphur.	Whenever mites appear.	Natural enemies are now generally efficient near the coast.
Mealy Bug.	Now controlled almost entirely by introduced natural enemies. Argentine ants must be kept away from trees if natural enemies are to do their work properly.		
Brown Rot.	Bordeaux (half strength).	Fall or early winter.	Usually required only on lower branches of lemons.
Thrips.	Lime-sulphur and nicotine sulphate.	Shortly after blossoming time.	May sometimes be combined with red spider control. Required only in interior.

### WALNUTS

Codling Moth.	Spray with 4 lbs. dry basic arsenate of lead to 100 gals. or dust with 15% arsenate lead dust.	May 25 to June 20. When hatch is well under way.	When both codling moth and aphids are present, add 1 pt. nicotine.
Aphis (when codling moth is not present).	Nico-dust.	May or June.	
Red Spider.	Sulphur dust.	When mites appear.	Bad only occasionally.
Walnut Blight.	Spraying not effective.		No control known.

### ALMONDS

What to Spray For.	Treatment.	When to Spray.	Remarks.
Shot Hole Fungus (Calif. Peach Blight).	Bordeaux.	Two applications—early fall and when buds are opening in spring.	May be followed by lime-sulphur in spring.
Red Spider (mites)	Lime-sulphur solution or atomic sulphur, or dry lime-sulphur.	Dormant season.	Generally successful. Lubricating oil emulsions also used in dormant season.

### GRAPES

Leaf Hopper.	Dust with 8 to 10% nico-dust (3 to 4% nicotine) or spray with nicotine whale oil soap solution.	May to July. During nymphal stage.	Dusting with calcium cyanide dust in spring, when the overwintering adults attack young growth, has given good results in the dry interior valleys, including San Joaquin, Coachella and Imperial valleys, but causes foliage injury in moist or coastal regions.
Mildew.	Dust with flowers of sulphur.	(1) When shoots are 8 to 10 in. (2) When fruit is size of buckshot.	
Mealy Bug.			Not usually treated for in southern California.

### OLIVES

Black Scale.	Miscible oil.	As early in winter as fruit is off the trees.	Olives will not stand full strength of dormant oil sprays.
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### FIGS

Fig Blight.	Bordeaux.	Fall (before rains).	Pruning an assistance.
Red Spider.	Atomic sulphur or sulphur dust.	When mites appear.	Important on Kadota variety only.

### Strengths of Materials to Use

Unless otherwise mentioned, the recommendations in this calendar are based on the following strengths of materials:

#### Arsenate of Lead—

Dry basic arsenate of lead is the best form. Use 3 lbs. to each 100 gals. of mixture. If paste arsenate is employed, use twice this amount.

#### Bordeaux—

For fall or dormant deciduous spraying, 5-5-50 or Bordeaux powder 18 to 20 lbs. to 200-gal. tank.  
For spring deciduous or any citrus spraying, 2-2-50 or Bordeaux powder 8 to 12 lbs. to 200-gal. tank.

#### Lime Sulphur Solution—

20 gals. to 200-gal. tank for all purposes listed except on citrus during warm weather, reduce to 6 gals. Casein has proven a very efficient spreader. Use at rate of 1½ lbs. to tank (200-gal.) with any of the sprays recommended.

#### Atomic Sulphur—

20 lbs. to 200-gal. tank for all purposes listed.

#### Nicotine—

1 pt. to 200-gal. tank. 3 gals. of liquid soap is an aid as a spreader.

#### Miscible Oil—

Several proprietary preparations for which the formulas vary.

#### Crude Oil Emulsion—

Crude oil (21-24)..... 25 gals.  
Liquid soap ..... 3 gals.  
Water ..... 175 gals.

"UNEASY rests the head that wears a crown," and His Majesty the Apple is no exception to the rule, according to the United States Department of Agriculture educational film, "King Apple's Enemies." Such insects and fungi as aphids, cankerworms,

red bugs, codling moths, tree tent caterpillars, plum curculio, San Jose scale, apple scab, leaf spot, apple blotch, bitter rot, sooty blotch, and many other orchard insurrectos constantly conspire to dethrone King Apple, and his defenders are frequently

called upon to mobilize their forces and declare war upon the enemies. Materials for controlling such insects and plant diseases and methods of applying them through the spray nozzle and dusting machine are recommended in the film.

Young Man: "Can I have this dance, madame?"

Young Lady: "No, I am too danced out!"

Young Man (a trifle deaf): "You're not, madam; you're just pleasingly plump."



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**N**O other event in the History of American Horticulture ever created such a furore among State and Government Horticulturists, Fruit Growers and Big Fruit Buyers as did this **STARKING \$6,000.00 Limb Discovery!**

During the years we have been testing **STARKING** several great Pilgrimages of Apple Experts have visited the farm where the **STARKING** Limb is to be seen. In these Pilgrimages, thousands of fruit authorities, including 43 State and Government Horticulturists, thronged to inspect and pass judgment on this Original **STARKING** Limb and the young 2nd Generation **STARKING** trees in bearing. The sight they beheld amazed them! The big, beautiful, all-over-red apples **IN AUGUST**, when Delicious on the other limbs of same tree and on all other Delicious trees in same orchard **WERE STILL GREEN** stirred them to enthusiastic and confident predictions of Success for **STARKING**. Here are a few of scores of positive statements made by experts who have seen and **KNOW** the **STARKING**. All these photos were taken while these men were examining the **STARKING** limb.



Prof. W. S. Brown  
State Horticulturist  
Oregon  
Who journeyed 3000 Miles  
to See The **STARKING**

## "You Have A Winner In **STARKING**!" Prof. Brown, Ore.

A leading Fruit Authority of the Northwest, **PROF. W. S. BROWN**, State Horticulturist, **OREGON**, came 3000 miles to inspect the **STARKING**. He declared:—

"You have a winner in this **STARKING** Apple! In testing a 1924 crop **STARKING** in February, we found the apple flavor excellent, color and finish especially good. Texture still solid and firm in February. Fine for shipping. Especially juicy and crisp for this time of year." (Feb.)



Prof. T. J. Talbert  
State Horticulturist  
Missouri

## "It Will Keep Without Getting Mealy!" Prof. Talbert, Mo.

**PROF. TALBERT**, State Horticulturist, **MISSOURI**, stated, after inspecting **STARKING**:—"STARKING colors to a bright all-over-red earlier and can be picked before it becomes mealy. It will keep through the Winter without getting mealy." [Prof. Talbert has tested the **STARKING** apple 6 months after being picked—and found it "very firm and juicy."] "This bright red color early in season will demand higher prices in the market."



Prof. Laurenz Greene  
State Horticulturist  
Indiana

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**PROF. C. D. MATTHEWS**, State Horticulturist, **NORTH CAROLINA**, another **STARKING** investigator, states:—"This new variety will be a tremendous money-maker for fruit growers. That is why I planted 750 **STARKING** trees in my own orchard in Spring of 1925. It is a super-Delicious because it colors earlier and is longer keeping so that it will keep until Spring. A wonderful apple has been discovered in **STARKING**!"

## "The **STARKING** Has Come To Stay!" Dr. Hedrick, N. Y.

In his speech after inspecting **STARKING**, **DR. U. P. HEDRICK**, State Horticulturist, **NEW YORK**, said:—"STARKING came into being in an improved form and will never return to the parent state. This is proved by the young **STARKING** trees which bear the same extra-red fruit. This gives the **STARKING** far greater value than Delicious:—its much earlier, all-over-red color makes it possible to pick and store before mealy."



Dr. U. P. Hedrick  
State Horticulturist  
New York



Prof. C. D. Matthews  
State Horticulturist  
N. Car.

## "I Want 200 **STARKING** Trees!" Prof. Greene, Ind.

**PROF. LAURENZ GREENE**, State Horticulturist, **INDIANA**, after visiting the Original **STARKING** tree, announced:—"I want to order 200 **STARKING** trees at once—100 for the Indiana Experiment Station and 100 for my own orchard. This variety of apples will demand a fancy market price—particularly since it will be advertised as you will advertise it."

**STARKING** One Limb cost \$6,000.00

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# Insects of Strawberries and Brambles in Midwest

By J. J. Davis, Purdue University Agricultural Experiment Station

## STRAWBERRIES

Insect.	Kind of Insect.	Chewing or Sucking.	Type of Injury.	When Injury Occurs.	Control.	References.
Strawberry leaf-roller.	Active, greenish larva (worm), $\frac{1}{2}$ in. long, inside rolled or folded leaf. Adult is a small brown moth.	Chewing.	Eats off upper surfaces of leaves, causing them to turn brown and die.	Throughout season—most severe in early summer.	Spray arsenate of lead, 3 lbs. to 100 gals. water, just before eggs hatch (about first week in May). Burn over or plow under beds after harvest.	N. J. Agr. Expt. Sta. Bul. 225. 26th Report of Ill. State Ent. p. 86.
Strawberry crown-borer.	Small whitish grubs, $\frac{1}{5}$ in. long, inside crowns. Adult is a brown snout beetle, $\frac{1}{6}$ in. long.	Chewing.	Eats out contents of crowns, leaving empty shell.	July to September.	Plow under badly infested beds and set new bed as far as possible from old one. Dig and set transplants in early spring.	Ohio Agr. Expt. Sta. Bul. 233.
White grubs.	Thick, fleshy, curled grubs with brown heads, 1 to 2 ins. long, in soil among roots. Adult is common brown May beetle.	Chewing.	Cuts off roots, killing plants.	Throughout season.	Rotation, using clover previous to strawberries. If planting must follow sod, pasture with hogs.	U. S. Dept. Agr. Farmers' Bul. 940.
Strawberry root-louse.	Small, green, wingless plant lice on crown leaves in early spring—blackish forms on roots. Not larger than a pin head.	Sucking.	Sucks juices from roots, killing plants, causing bare spots in bed. Poor formation and ripening of fruit.	Throughout season.	Set clean plants. Dip plants in 40% nicotine sulphate (1 to 800) before setting as precaution. Rotation. Thoroughly cultivate field previous to planting. Burn over beds in November.	N. J. Agr. Expt. Sta. Bul. 225. Del. Agr. Expt. Sta. Bul. 49.

## RASPBERRIES AND BLACKBERRIES

Insect.	Kind of Insect.	Chewing or Sucking.	Type of Injury.	When Injury Occurs.	Control.	References.
Raspberry cane borer.	Beetle an elongated insect, about $\frac{1}{2}$ in. long, black with yellow thorax bearing 2 or 3 black spots. Larva cylindrical, yellowish with a brown head and about 1 in. long.	Chewing.	Larva bores in canes. Adult beetle girdles tips of tender canes at time of egg-laying, causing them to wilt.	Beetle injury in May and June. Larvae present from June till following spring.	Pinch off wilted tips in June, a few inches below point of girdling.	Ohio Agr. Expt. Sta. Bul. 96. N. J. Sta. Dept. Agr. Clr. 58.
Red-necked cane borer.	Beetle small, about $\frac{1}{2}$ in. long, bluish black with a red thorax. Larva whitish, slender and about $\frac{3}{4}$ in. long.	Chewing.	Infestation evidenced by swollen area on cane. This later cracks and weakens cane. Larva within makes spiral burrows in sapwood.	July till winter.	Cut out and burn infested canes in fall and early spring.	U. S. Dept. Agr. Farmers' Bul. 1286.
Raspberry root borer.	Adult a clear-winged moth. Larva yellowish, cylindrical and about 1 in. long.	Chewing.	Burrows in roots and crowns. Weakens and sometimes kills plant outright.	Late summer and spring.	Dig out borers.	Wash. Agr. Expt. Sta. Bul. 63.
Rose scale.	Whitish, circular scale, about the size of a pin head on canes.	Sucking.	Weakens canes.	Throughout year.	Cut and burn badly infested canes. Dormant sprays of oil or lime-sulphur effective.	Ohio Agr. Expt. Sta. Bul. 332.
Striped tree cricket.	Adult greenish yellow, about 1 in. long. Eggs laid in berry canes.	Sucking.	Weakens canes at point where eggs are laid.	Injury (i. e., laying of eggs in canes) during August and September.	Cut out and burn affected canes in fall or early spring.	N. Y. Agr. Exp. Sta. Bul. 388.

# Lubricating Oil Emulsions on Peach Trees

By Charles H. Alden  
United States Department of Agriculture

LUBRICATING oil emulsions have long been used for citrus insect control, but it is only within recent years that they have been employed for dormant spraying of peach trees attacked by the San Jose scale. In experiments extending over a three year period, the writer has tested both the home-made and commercial preparations and each has proved satisfactory from the standpoint of cost, efficiency and ease of application.

### Oils, Soap, Stickers and Water

Any good grade of lubricating oil, whether asphaltum or paraffin in base, will make a good emulsion. An oil which has given good results in our experiments has the following analysis:

Color.....light red  
Specific gravity at 20 degrees C.....0.899  
Flash point (Pensky-Martin closed cup).....127 degrees C.  
Fire point (Pensky-Martin open cup).....238 degrees C.  
Viscosity (Saybolt) at 100 degrees F.....242 seconds  
Volatility (loss after 4 hours at 105 degrees C.).....0.11 per cent  
Residue after ignition.....None  
Reaction.....Neutral  
Cold test, slightly viscous at.....5 degrees C.

If soap is used as an emulsifier, the best results will be obtained with a potash fish-oil soap having a water content of between 60 and 70 per cent. In emulsions made without heating, any of the calcium caseinates may be substituted for the potash fish-oil soap.

It is always best to use soft water both for making the stock emulsions and for diluting the spray. This is especially true in preparing the soap emulsions, since the soap combines with the lime in hard water to form a lime soap and allows the oil to separate out from the emulsion. When only hard water is available for making the soap emulsion, it can be softened by the addition of one pound of caustic soda or lye for each 100 gallons of water, or Bordeaux mixture at the rate of one-fourth pound of copper sulphate and one-fourth pound of stone lime to 50 gallons of water. In those emulsions made with calcium caseinate, the oil and hard water will emulsify if properly pumped.

### Kinds of Emulsions and How to Make Them

Lubricating oil emulsions may be made by either the boiled or the cold

pumped method, or they may be purchased ready for use from insecticide dealers. The oil may be either paraffin or asphaltum base, and good

results have been obtained with oils having a viscosity of from 200 to 250 seconds by the Saybolt test at 100 degrees Fahrenheit.

By the boiled formula, the emulsion is made as follows:

	Small quantity.	Large quantity.
Red engine oil, or oil of similar grade.....	1 gal.	30 gals.
Potash fish-oil soap.....	1 lb.	30 lbs.
Enough water added the above soap to make.....	$\frac{1}{2}$ gal.	15 gals.

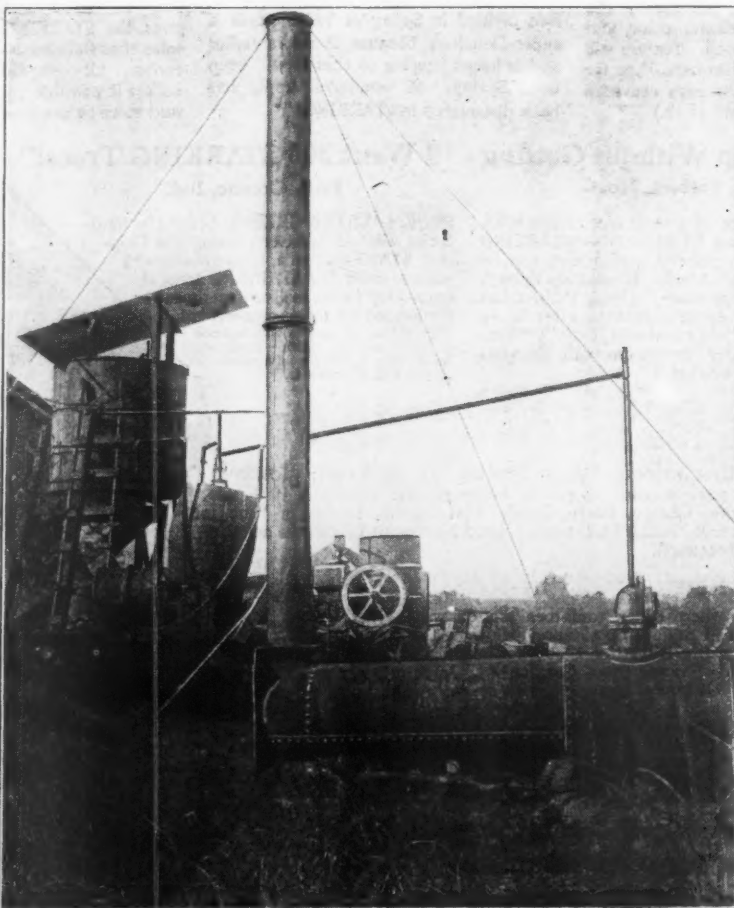
When a small quantity is to be prepared, the soap is dissolved in water to make one-half gallon, and the one gallon of oil is then added and the ingredients placed in a kettle and boiled for a few minutes until the brown scum, which forms on the top, has disappeared. Then the kettle is removed from the fire and the contents pumped twice under at least 60 pounds pressure while still hot. This type of emulsion should be used shortly after it is made.

To make the boiled emulsion on a large scale, use the same proportions as given for the small quantity. The following equipment is necessary: two 50-gallon barrels, one 300-gallon storage tank, one all-metal triplex pump developing 250 pounds pressure, one four horse power engine, one boiler, and necessary connections. This equipment would be of use only to growers with a large acreage or to a group of growers with smaller acreages. When made on a large scale and pumped four times under high pressure, the emulsion will hold up for several months. The method given for preparing large quantities is somewhat similar to that employed by manufacturers, and such emulsions will hold up during the entire spraying season when they are properly made.

By the cold-pumped formula the emulsion is made as follows:

Red engine oil, or oil of similar grade.....	30 gals.
Calcium caseinate.....	4 lbs.
The above calcium caseinate and water to make.....	15 gals.

The following equipment is necessary for preparing the cold-pumped emulsion: two 50-gallon barrels; one duplex or triplex pump; and one three or four horse power engine (the ordi-



Equipment for making lubricating oil emulsion

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for February, 1926

nary power sprayer with suction attachment).

The four pounds of calcium caseinate are thoroughly and rapidly stirred in two gallons of water and then stirred in with enough water to make 15 gallons of the mixture in a 50-gallon barrel. Then the 30 gallons of oil are added to the 15 gallons of calcium caseinate and water, the mixture being constantly stirred until all the oil is added. The suction hose is then placed in the barrel and the motor started. When the pressure registers 250 pounds, the ingredients are allowed to be sucked through the pumps and out through either one or both spray rods, either with the disks removed or with disks having a three-sixteenths-inch aperture, into another 50-gallon barrel. This emulsion should be passed through the pumps under pressure three times, and should be made daily as required.

#### How to Use Lubricating Oil Emulsions

These emulsions are for use during the dormant period and cannot be recommended for spraying while the trees are in foliage. Tests made with both types of emulsion in September when the leaves were on the trees resulted in about 25 per cent premature defoliation and gave a poorer scale control than the dormant application.

For a light to moderate scale infestation, six gallons of the stock emulsion to 194 gallons of water should be used. For a heavy or incrustated scale infestation, nine gallons of the stock emulsion to 191 gallons of water should be used. One thorough application is usually sufficient, but if necessary a second application of the weaker strength may be used during one dormant season. It is highly important that every part of the tree be covered with the emulsion, since the spray kills only where it hits the scale, and if portions of a tree are not covered, the whole tree, and possibly the whole orchard, may become reinfested.

In spraying, the outfit with two sprayers should pass down every other middle, each tree being sprayed all around before driving on. About one gallon of the dilute oil emulsion is required to cover one peach tree of average size.

Several precautions should be observed when using oil emulsions. Tanks that have been used for lime-sulphur must be thoroughly cleaned before the oil emulsion is put into them. Lime-sulphur residue may be removed by running a strong solution of caustic soda through the pumps, and also by scrubbing the inside of the tank with the same material. The stock emulsion should never be exposed to a temperature lower than about 15 degrees Fahrenheit, at which point it freezes. Examine the stock emulsion for free oil before and after the water is added, for when free oil occurs, it is not fit for use and should be discarded or repumped. Too much pumping will break down the material, however. Care should be taken that the emulsions are made according to directions.

#### Effects on Scale and Tree

Microscopic observations of thousands of scale insects over a three-year period have shown that a two per cent oil emulsion, or six gallons to 194 gallons of water, will give a mortality of from 97 per cent to 100 per cent for a moderate infestation during the dormant period; if the infestation is heavy, it is necessary to spray twice at this strength in one dormant season. One application of a three per cent oil emulsion, or nine gallons to 191 gallons of water, gave a mortality of from 98 per cent to 100 per cent for all infestations from light to incrustated. Treatments by growers in various parts of the peach belt during the 1923-24 season gave a mortality of from 97 to 100 per cent and caused no tree injury.

In the experimental orchards, no injury to the collar or any other part of the tree could be found, and twigs and buds examined under the microscope showed no discoloration of the bark layers and cambium, and all

buds examined appeared healthy except those that had been killed by low temperatures or causes other than oil sprays.

#### Methods and Results

Experimental work with lubricating oil emulsions has been carried on since the fall of 1922. In most cases the peach trees used were heavily infested with the San Jose scale. In one orchard the material has been applied for three consecutive years in order to determine whether or not cumulative injury would result, and all observations have shown the trees to be as healthy and fruitful as those that have not been sprayed with the oil emulsions. In some cases the trees have been sprayed twice in one dormant season. Both the boiled and the cold-pumped formulas have been used at one, one and one-half, two and three per cent strengths. Observations have been made on scale mortality and tree injury over a three-year period, and the results show a good scale control and no tree injury.

#### Summary

1. A good grade of lubricating oil, as indicated in the paper, a potash fish-oil soap or calcium caseinate, and

soft water are needed in making lubricating oil emulsions.

2. Lubricating oil emulsions may be made by either the boiled or cold-pumped methods, and both types give satisfactory results.

3. These emulsions should be used during the dormant period of the peach trees, at the rate of six gallons of the stock to 194 gallons of water for a light to moderate infestation; and nine gallons of stock to 191 gallons of water for a heavy to incrustated infestation.

4. A scale mortality of from 97 to 100 per cent when properly applied has been obtained from spraying with these emulsions.

5. The experiments reported in this paper have extended over a period of three years; the trees in some cases being sprayed twice in one dormant season. No injury has resulted where the emulsions were used at from one to three per cent strength during the dormant period. One orchard has been sprayed for three consecutive years and shows no signs of cumulative injury.

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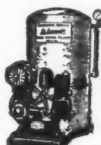
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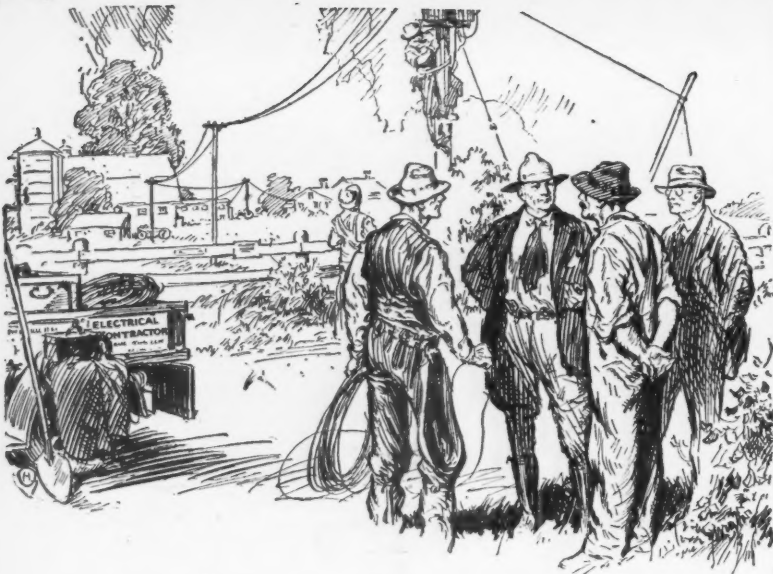
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### The Codling Moth in Washington

WHILE not as serious a pest in Washington as it is in some other states, the codling moth is the most serious and widespread insect pest that the apple growers here have to deal with. The climatic conditions are such that two practically complete generations occur, with a small third generation in some seasons.

Extensive studies of the moth have been made in the Yakima Valley by the Bureau of Entomology, United States Department of Agriculture, the results of which have just been published as Department Bulletin 1235, Life History of the Codling Moth in the Yakima Valley of Washington.

Copies of this technical bulletin, and of Farmers' Bulletin 1326, Control of the Codling Moth in the Pacific Northwest, a popular publication based upon it, may be had on application to the Department of Agriculture, Washington, D. C. These two publications contain a full account of the codling moth, both from a technical and practical standpoint, and every apple grower in the Northwest should secure copies of them.



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## The Editor's Mail Box

### Cross Pollination of the Black Twig

AMERICAN FRUIT GROWER MAGAZINE: I have an orchard of Black Twig apples that blooms well as a rule, and the trees appear healthy and vigorous, but I get very little fruit. What can I do to make the trees bear better?—R. E. S., Pennsylvania.

ANSWER: This question was discussed at the recent convention of horticulturists at Kansas City. Dr. E. C. Auchter of Maryland stated that he had used pollen of a number of standard varieties on the Black Twig. The pollen of Jonathan and Delicious gave the best results; in fact, Dr. Auchter stated that an excellent setting of fruit was obtained when pollen of these varieties was used. He has also observed that solid blocks of Black Twigs rarely bear a good crop. He found two orchards in the East which are interplanted with Delicious and the owners are well satisfied with results.

Dr. LeRoy Childs of Oregon reported that Black Twig was a heavy bearer in the Hood River, Ore., district, where the variety is commonly interplanted with Yellow Newtown and Spitzenberg.

It appears, therefore, that Black Twig will not set fruit well when planted alone. In eastern sections it is apparently a good thing to interplant the variety with Jonathan and Delicious and in western sections with Yellow Newtown or Spitzenberg. In the case of solid blocks of Black Twigs, topworking part of the trees with scions of the above varieties should in a few years give satisfactory results.

prevent the vine from bearing too heavy a crop the following year, and it will help to prevent a tendency to ward on and off years.

### Handling Oil Emulsion

AMERICAN FRUIT GROWER MAGAZINE: I am always interested in reading the Editor's Mail Box. I noted particularly your comments on oil emulsion in the last issue. I have used oil emulsion for dormant spraying on peaches for three years without any indication of cumulative damage. It gives me better results than lime-sulphur, but it must be well emulsified and must not be applied when the temperature is below 40 degrees Fahrenheit. Neither should it be applied when the trees are wet from dew or rain. The trees must be dry to get the best results. If the oil has separated from the water, it can be re-emulsified by running it through a power sprayer under at least 60 pounds pressure, two or three times.

For rabbit protection, I find galvanized window screening best. I buy screening 30 inches wide, cut it down the middle to make two strips 15 inches wide, then cut it into pieces six inches wide and roll these strips on a small gas pipe or chair rung to give them the proper shape. The pieces can be sprung open and closed nicely around the tree trunk. These wrappers can be prepared at home and the cost, without labor, will be about one-half cent each.

Another way to protect trees from rabbits is to kill a rabbit, cut it open and rub the flesh part on the trunk of the tree. Now laugh! I did the same until I saw with my own eyes the good results.—W. F. M., Arkansas.

ANSWER: We appreciate your interest in the Mail Box, Mr. Morris, and we are sure that readers will be glad to receive your information regarding the handling of oil emulsion and protection of trees from rabbits.

### Cross Pollination of Sweet Cherries

AMERICAN FRUIT GROWER MAGAZINE: Is there any difference between the Royal Ann and Napoleon cherries?

Would the Bing or Lambert be a good variety to set with the Napoleon for cross pollination? How often should I set the pollinizers?—E. E. W., Michigan.

ANSWER: The Napoleon and Royal Ann sweet cherries are the same variety. I know of no pollination studies of sweet cherries made in your section. In California and Oregon the Bing, Lambert and Napoleon have proved inter-sterile with each other. They cannot, therefore, be used as cross pollinators for each other.

In Oregon, the Black Republican, Black Tartarian, Centennial and Governor Wood have proved suitable, in the order named, as pollinizers for the above three varieties. In planting new orchards, every third row should be planted with a pollinizer. In orchards already planted, topworking should be employed. One branch in each tree may be topworked with scions of pollinizers, or whole trees, properly distributed, may be worked over to the pollinizer. If the latter method is employed, the topworking should be spread over three or four years in order to avoid giving the trees too great a shock.

In California the Black Tartarian, Early Purple, Pontiac and Black Republican, in the order named, have proved satisfactory pollinizers for the Bing. For the Napoleon and Lambert varieties, the Black Tartarian, Black Republican and Pontiac are the most satisfactory pollinizers.

Of course, the conditions in California and Oregon may not apply to Michigan, but it seems to me the chances are good that they will apply in a general way. It might be a good thing to use two of the most promising varieties named for pollinating the sweet cherries you propose to plant. I would suggest that you try the Black Republican and Black Tartarian as pollinizers.

### Prune First or Spray First?

AMERICAN FRUIT GROWER MAGAZINE: I want to prune my orchard this winter and also spray it for scale. Do you think I would spread the insects and diseases around in the orchard if I pruned first, or do you think I ought to spray first?—W. E. C., Kansas.

ANSWER: You will find it best as a rule to prune before you spray. By this means you will have fewer branches to cover with spray, and because the trees will have somewhat less wood in them, you will be able to spray the trees more thoroughly. If time is a factor, you will find it well to remove at least the larger limbs before spraying.

In the case of old trees incrustated with scale, you will increase the percentage of kill if you scrape the trunks and larger branches before spraying. Take care to cover the tree thoroughly when spraying for scale.

### On and Off Years in Grapes

AMERICAN FRUIT GROWER MAGAZINE: My grapes made a tremendous growth last year. Since they bore a light crop last year, would I not be justified in leaving a little more wood on them this winter than usual? Under the conditions, could not the vines bear a heavier crop than normally?—L. E. M., New York.

ANSWER: This subject was discussed by Dr. N. L. Partridge at the recent meeting of horticulturists in Kansas City. Since he has thoroughly investigated the subject, his recommendations should be pertinent in this connection.

In seasons of light crops, grapevines usually make a large growth. Furthermore, the buds produced have larger primordia, that is, they have the capacity for large production. If we leave more growth than usual, we permit the setting of a very heavy crop. This tends to stunt the plants and to prevent the development of good growth and strong buds for the crop of the following year.

With these things in mind, you can see that the practice you propose would tend to promote on and off years in your vineyard, which is a condition you do not want.

In off years when a heavy growth is produced, it is best to prune a little heavier than normally. This will

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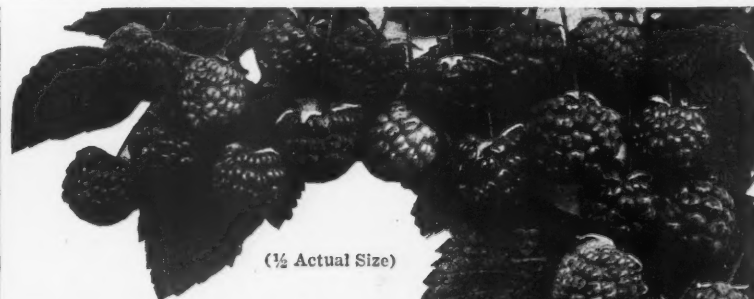
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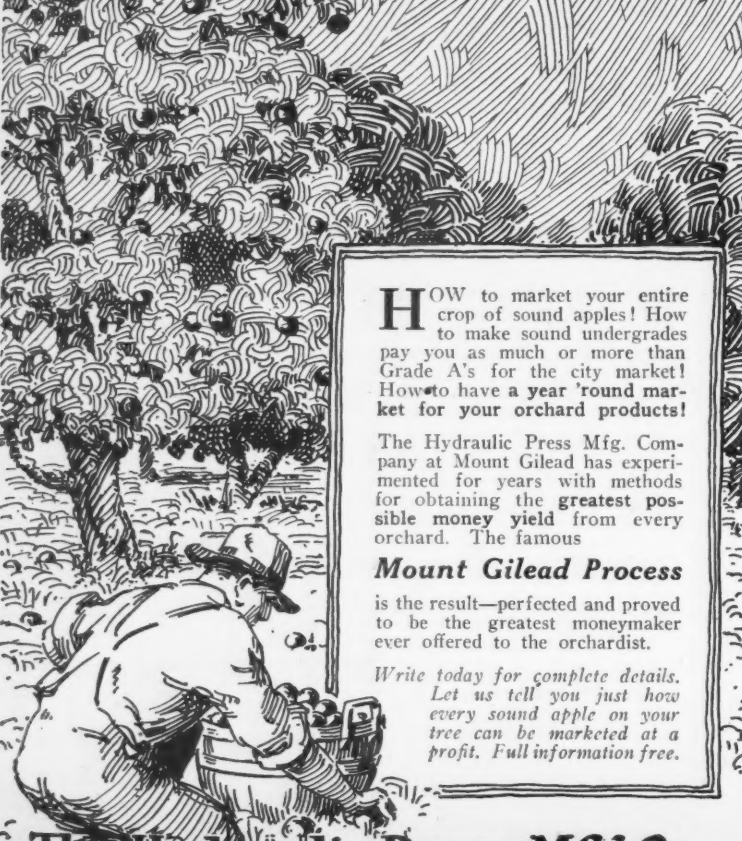
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## With the Co-Ops.

"IT SEEMS obvious that government supervision and control of the co-operative movement are not desirable. Co-operative associations are business concerns. Like other business concerns, they must eventually stand or fall by themselves. They cannot fairly be asked to accept a degree of regulation and control from which private distributing agencies are exempt. Removing responsibility for their actions from the co-operative associations themselves to the government might be fatal to their efficiency. It would certainly not encourage men of executive ability to seek managerial positions in the movement. Effort to regulate co-operation minutely by law or by administrative edict would cripple the initiative of the co-operative associations and force them into a rigid mold when their greatest need is flexibility. Excessive regulation might smother the movement.

"What the department is already doing indicates the nature of the service it can give to co-operation. It is studying marketing problems and making surveys indicating what are the prospects of various co-operative projects. It is examining the causes of success and failure in co-operation, and giving counsel to association boards of directors and managers. It is helping by counsel and advice groups of farmers to develop effective organizations and to plan wise merchandising policies. It is popularizing the use of uniform and up-to-date accounting systems and office records among co-operative associations. It is analyzing marketing operations to reveal their strong and weak spots and assisting associations in developing their own methods of market analysis. It is aiding co-operatives to extend their markets at home and abroad. It is acquainting American co-operators with the experience of co-operators in other countries. It is furnishing market-news services, and establishing commodity grades and standards to facilitate trading. It is helping producers to correlate their production plans, so that the hills and valleys of production can be leveled out to some extent."—Abstract from annual report of Secretary of Agriculture.

**A**N INTERESTING court decision was recently rendered in Kansas pertaining to the application of the income tax to a growers' co-operative marketing association.

In 1923 the State Tax Commission ruled that a wheat growers' co-operative association should be classed as a merchant for purposes of taxation and required to pay taxes upon the average amount of wheat in its possession during the year.

The association brought suit against the commission and enjoined them from collecting the tax. The commission appealed the case and the Supreme Court of Kansas rendered a decision in favor of the association on December 5, 1925.

The technical question involved was whether or not the association purchased the product with the view of selling it at an advanced price for profit. The court took the view that the relation between an association and member is not that of buyer and seller. The association is a corporation but not for gain. It seeks no profit for itself. It is merely an instrument through which members market their own crops. Members do not bargain with it over prices. The members of the association receive all the benefits, and the association, as a

corporation, receives none. The association is not a merchant within the sense of the statutory definition, for no price is made as between the member and the association. The member receives the full price obtained, less present and future expenses. Any profit made belongs to the members and is not the property of the association.

This decision is an important one and seems to be a most rational view with respect to the application of income tax laws to farmers' co-operative associations.

"SAY IT with prunes this year" is what the California Prune and Apricot Growers' Association told its members just before the holidays. As an advertising feature, members were advised to send five-pound boxes of prunes to friends in eastern sections instead of other presents. Officers and directors of the association believed that such action on the part of many members would materially increase public interest in prunes and stimulate consumption. Fancy prunes attractively packed were furnished by the association at cost to members who wished to follow the suggestion.

**A** BILL to create a division of co-operative marketing in the Department of Agriculture and to provide certain aid for co-operation which was worked out by Secretary Jardine in conference with leaders of the co-operative movement was introduced into the Senate as S. 1910 by Senator McNary and into the House as H. R. 6240 by Mr. Haugen. The bill authorizes and directs the Secretary of Agriculture to establish a division of co-operative marketing with suitable personnel in the Bureau of Agricultural Economics. The duties of the division shall be to render service to co-operative associations by collecting, analyzing and disseminating information on co-operation; by making studies of the economic, legal, financial, social and other phases of co-operation; by making surveys and analyses of accounts and business practices of associations on request; by conferring with and advising groups desiring to form marketing associations; by acquiring information concerning crop prospects, supply, demand, current receipts, exports, imports, and prices of commodities handled by co-operative associations and having qualified commodity specialists to summarize and analyze this information; by promoting the knowledge of co-operative principles and practices; and by special studies. The bill also authorizes the Secretary to call advisers to counsel with him relative to specific problems of co-operation. Co-operative marketing associations are permitted to acquire and exchange information concerning their products; and an appropriation of \$225,000 is provided for the fiscal years 1926 and 1927.

**THE SPARTA** Fruit Growers' Exchange of Sparta, Wis., is promoting the planting of about 400 acres of red raspberries within the territory covered by the exchange. The organization has induced a cannery to locate in its vicinity, and in the opinion of officers and directors, growers will obtain good results in growing raspberries for this cannery.

**SOME** time ago, in connection with the reorganization plans of the California Prune and Apricot Growers'

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Association, the directors, following a vote of the membership, sent out a questionnaire to secure a vote (1) on the advisability of allowing withdrawal on the part of members; (2) on the advisability of abolishing the voting board which elects the board of directors; and (3) providing for the election of directors by the direct vote of members.

The association has 11,396 members, but only 9705 are at present active. These growers represent 107,839 acres of prunes and 36,672 acres of apricots. Only 4450 growers filled out the ballot in regard to permitting withdrawal. This number was less than half the number of active members. A total of 2252 votes was cast in favor of the withdrawal privilege, and 2123 votes were against it, an apparent majority of 124 for the affirmative. The members voting for withdrawal control about one-fourth of the acreage of the total membership.

A total of 4200 ballots was cast in regard to the abolition of the voting board. Of this number 3135 favored abolition and 1065 opposed it, giving an apparent majority of 2070.

Since a majority of the active members of the association did not participate in the vote, the voting board of the association at its semi-annual meeting in November was unable to determine the wishes of the members and therefore it decided to continue the present form of organization until such time as the will of the majority of the members could become more definitely known.

**THE PRESIDENT** and general manager of the Yakima Fruit Growers' Association, Yakima, Wash., recently held 12 district meetings. The meetings were so arranged as to time and place that practically all members could easily attend one of them and thus have an opportunity to meet the officers and learn about the affairs of the association first hand.

The officers are to be complimented on this move. Such methods are part of the publicity plan which should be followed by all co-operatives. A co-operative belongs to its members and they desire to be kept informed, as far as sound business principles will permit, about the affairs of the association. The officers who fail to keep their members informed are neglecting both a duty and an opportunity.

The program of the association calls for the enlargement of five packing houses and for the addition of new sizing and cold storage equipment.

**BOB ENDICOTT** of the Villa Ridge unit of the Illinois Fruit Growers' Exchange tells an interesting story about how dissatisfied members are handled in this territory. Some of the members of his local unit were expressing dissatisfaction without apparent cause. The directors called a meeting of members and frankly advised those present that if any of them were dissatisfied they could withdraw, but that if they did so they could not return to membership for a period of five years. Three of the members withdrew. One of them, after he had walked about 100 yards, came back to the office and admitted that he had probably been hasty and desired to continue his membership. He was not re-admitted.

**THE MUTUAL Orange Distributors** of Redlands, Calif., has added 35 local units to its membership during the past year, while only one association withdrew. In the annual report for the year ending November 13, 1925, General Manager C. P. Early stated that notwithstanding the smaller crop in 1925 a larger return was made to growers than for the crop of 1924. Over 30,000 orchard heaters were distributed to members. The manager predicts a larger tonnage for the coming season than it has ever handled in the past.

They've made false teeth you can eat with, false arms you can work with, false legs you can walk with, but nobody has ever made a false eye you can see with.

## When Our Ancestors Harrowed with a Pile of Brush—

### Very Little Profit Was Taken From the Soil

Just take a look around your neighborhood and notice carefully the progress that has been made possible largely through the help of good farm equipment. Conditions are not ideal, of course, but everybody is making a living and enjoying life to an extent undreamed of not so many years ago.

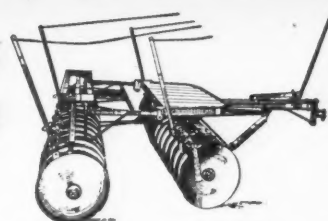
Yes, things are better, and the McCormick-Deering dealer sells the tools that will carry progress still further. For instance, there is the Dunham Culti-Packer and the McCormick-Deering line of disk harrows [both horse-drawn and

tractor types], spring-tooth harrows, field cultivators, rotary hoes, and peg-tooth harrows. Each one of these tools meets a special tillage need. Each one is of old-reliable McCormick-Deering quality.

If you are anxious to increase your farm earning power make it a point to see these tools. You'll be surprised at the improvements made since you purchased your old equipment.

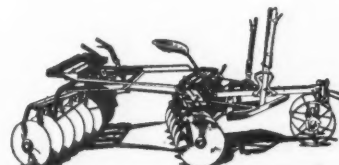
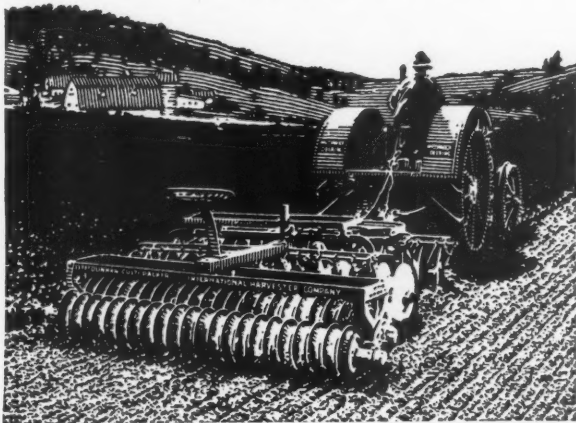
To Fill All Your Tillage Tool Needs See the McCormick-Deering Dealer. It Pays!

**INTERNATIONAL HARVESTER COMPANY**  
606 S. Michigan Ave. of America Chicago, Ill.  
(Incorporated)



McCORMICK-DEERING  
Tractor Disk Harrow

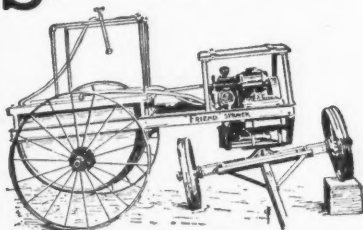
"Good Equipment Makes  
a Good Farmer Better"



McCORMICK-DEERING  
Disk Harrow

## McCormick-Deering Tillage Tools

## SPRAYING FOR PROFITS



Needless to say all fruit growers spray for the same purpose—"PROFITS"—but all are not successful.

It costs money to spray, therefore the grower who makes a profit must spray thoroughly but economically.

The "Friend" high pressure sprayer returns bigger profits because it produces the necessary fine, penetrating, mist like spray at less cost.

Get full information on the "Friend" and its simple, economical features before you buy.

### 10 REASONS WHY "FRIEND" IS BETTER

- 1—Low down—easy to fill; cut clear under—short turn; does not tip over on hillsides.
- 2—Weight of solution on high wheels—easy draft.
- 3—Direct propeller agitator—no gears, belts or chains to break or slip.
- 4—Motor and pump in one unit—compact and light.
- 5—Straight gear transmission—no chains or belts to break or slip.
- 6—Dual cooling device.
- 7—Perfect and constant lubrication.
- 8—Adjust packing with one finger while pumping at high pressure.
- 9—Remove only two screws to replace plunger tube and packing. Loosen only two screws to remove valve cage and seat.
- 10—Handy valve lifters for loosening intake valves if stuck, and drain plugs on all valves.

There are many more reasons. Write at once for Free Catalog.

"FRIEND" MANUFACTURING CO.,  
110 East Ave., Gasport, N. Y.

Cuts from both sides  
of limb—Does not  
Bruise Bark

The most powerful  
pruners made.  
Forged from tool  
steel, ground  
and tempered.  
In use  
throughout the  
world.

All sizes.  
All styles.  
Delivered free  
to your door

**RHODES**  
Double Cut  
PRUNING SHEAR

Send coupon for free booklet  
with pictures and prices.

Send  
Coupon

**RHODES MFG. CO.,**  
332 S. Div. Ave., Grand Rapids, Mich.

Name \_\_\_\_\_  
Address \_\_\_\_\_



## It Pays to Spray

A good spraying outfit is one of the best insurance policies a fruit grower can have.

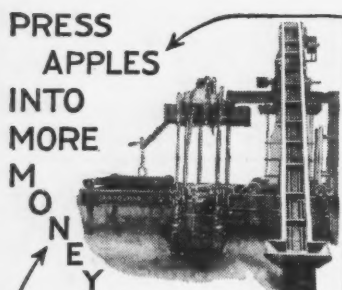
And a gasoline engine is an important part of the modern spraying outfit. Orchard sprays to be effective must be put on with from 150 to 200 pounds pressure.

A Hercules engine and a spray pump, used at the proper time, will soon demonstrate their value in better and more marketable fruit.

Hercules engines are standard equipment on some of the best known spraying outfits of the country. Further information will gladly be given you on request.

Lots of good farmers say a Hercules engine is "the best hand" they have.

**The Hercules Corporation**  
Evansville, Indiana



## With A FARQUHAR CIDER PRESS

Big Money in custom pressing if you install a Farquhar Cider Press. Apple Growers in your community will keep the press busy through the entire season, —and you will have a profitable income each year.

Write for our new illustrated catalog No. 126. Ask about our Engines and Sawmills, Grain Threshers and Hay Balers.

**A. B. Farquhar Co., Limited**  
Box 103, York, Pa., U. S. A.

## Markets and Marketing



THE HANDLING and selling of fruits and vegetables is a highly specialized business and demands a language all its own. For many years there have been frequent disputes between buyers and sellers as a result of misunderstandings in regard to the meaning of trade terms.

During and immediately after the war, various trade organizations undertook to formulate standard terms and rules of conduct for the fruit and vegetable business. The United States Department of Agriculture lent its assistance. A list of "Standard Rules and Definitions of Trade Terms for the Fruit and Vegetable Industry" was eventually worked out, and these were printed and distributed among members of the trade and other interested parties. These rules and definitions have been in use since that time and have proved extremely useful. They have undergone only minor changes since they first appeared.

While these rules have proved helpful, there has been a tendency to disregard them in certain quarters. To make them more helpful, the Department of Agriculture is proposing further co-operation among trade interests in regard to recognition of the rules.

The first recommendation is that in connection with the trade terms official grades be used to describe the products in question, unless they are sold under well known brands based on written specifications. The second suggestion provides that disputes be referred to the Secretary of Agriculture if the parties cannot agree. The third provides for investigation of grievances in connection with purchases and sales, including those made through merchants and brokers. The final suggestion is that the department enter into a co-operative agreement with each shipper, dealer, broker, commission merchant or other wholesale distributor regarding the matter.

The department hopes furthermore to be able to maintain a permanent arbitration board. After the department has handled a sufficient number of cases to establish precedents, it is hoped that the industry will be able to set up its own machinery for handling the situation through the appointment of a disinterested board.

Representatives of the department are explaining the proposed plans to various trade organizations at their conventions this winter. It is a movement which will do much good and one which will be thoroughly approved by every grower and shipper.

Those who are interested in this matter should write the Department of Agriculture, Washington, D. C., for Service and Regulatory Announcement No. 97.

THE PLACE of advertising as a factor in American business is shown by some figures collected by Edward Bok, Editor of the *Ladies' Home Journal* for many years. The amount of money spent for advertising of different kinds is estimated as follows:

Newspapers	600,000,000
Direct advertising	300,000,000
Magazines and weeklies	150,000,000
Trade papers	70,000,000
Farm papers	27,000,000
Electric and painted signs	30,000,000
Demonstrations	24,000,000
Novelties	30,000,000
Posters	12,000,000
Street cars	11,000,000
Motion pictures	5,000,000
Programs	5,000,000
<b>Total</b>	<b>\$1,264,000,000</b>

Such expenditures seem enormous, but they must bring results or business concerns would not continue to advertise year after year. If advertising pays in business, it will pay also in agriculture. It can be used to advantage particularly in increasing the consumption of products and in interesting the public in new products. As a matter of fact, several fruit co-operatives have demonstrated beyond all doubt the practicability of increasing the consumption of fruits through advertising. Before advertising can be made most effective, however, there must be quality production and efficient standardization, accompanied by the use of brand names, trade-marks and slogans.

APPROXIMATELY \$150,000,000 worth of fruit products was handled by American fruit auctions in 1923, according to a recent report of the United States Department of Agriculture. The volume of products handled by these agencies has more than trebled since the year 1912, when products to the value of \$50,000,000 were handled.

The auctions provide a rapid sales medium and are used particularly by large private and co-operative organizations which must keep their large volume moving in a continuous stream.

During 1923, 24 fruit auctions were operating in 14 leading cities. Fruit auctions are practicable only in markets which handle a sufficient quantity of products to attract a large number of buyers.

Recent tendencies have necessitated reorganization, consolidation and the establishment of new auctions in several cities. In some cases the changes have resulted from demands of the trade for impartiality in the services rendered and the charges imposed. Furthermore, there was a desire of members of the trade in some places to participate in the profits of the auctions. There is a distinct tendency at the present time toward greater uniformity in methods and practices, according to the Department of Agriculture.

A great variety of commodities are handled by the auctions, but most of them consist of citrus and deciduous fruits. The salesrooms are open to the public, and anyone can buy. Charges and commission rates by the various companies lack uniformity, but in most cases the charges are less than the cost of selling by private sale. An advantage that is appreciated by many growers is that the companies ordinarily make returns to shippers within 24 to 48 hours after the sale is made.

A detailed report of the study of fruit auctions by the Department of Agriculture is contained in Department Bulletin No. 1362, a copy of which may be obtained from the Department of Agriculture, Washington, D. C.

THE UNITED STATES Bureau of Agricultural Economics is issuing reports to European fruit interests regarding conditions in the United States and Canada. These reports are being distributed from London by Edwin Smith, who is representing the Bureau of Agricultural Economics in Europe and is studying fruit markets there. In the first report he outlined the market news service on fruits furnished by the federal bureau and gave statistics of fruit production and marketing in the United States.



## A Safe Summer Spray

Spray in the summer for San Jose scale. You can do it with Volck, a new type of oil spray which not only gives highly effective control, but can be applied any time of year without the old burning hazard of fruit and foliage. It has been extensively used in the famous Wenatchee and Yakima Valleys of Washington, where it has not only cleaned up scale and codlin moth, but has saved many thousands of dollars worth of apples that would otherwise have been unmarketable.

### Insures Fancy Fruit

Volck not only cleans up the trees, but cleans up the fruit. The scale is killed, the red spots disappear, and you get smooth, clean, fancy apples, the kind that enjoy the best markets and bring the top price.

Methods of citrus insect pest control in Southern California and Florida have been revolutionized by the use of Volck. Thousands of acres are now sprayed, regularly with this material and even the so-called resistant scales, once considered immune to efforts at control, have been completely conquered.

### Used on Tender Plants

Volck has also proven highly effective against red spider on strawberries, and in the control of scale and other insect pests on very tender plants where control was formerly complicated by the high hazard of burning and injury.

Write for booklet and full information on this new improved method of insuring clean trees, maximum production and fancy fruit. We'll show you the way to bigger profits.

**California Spray-Chemical Co.**  
204 Franklin Street, New York City



Also: Wasonville, California; Yakima, Washington; Orlando, Florida; and many other centers.

**VOLCK**



## "It Is Useful"

Because it can be used with so many other machines, for so many operations, a Case tractor is the most generally useful machine on the farm.

"We have used our Case 18-32 to good advantage this year in plowing, discing, harrowing, (three times over in two fields, to kill weeds), threshing, silo filling and corn shredding. We also graded six miles of road and threshed for nine neighbors. It's a useful and profitable machine."

**J. I. Case Threshing Machine Co.**  
Incorporated Established 1842  
Dept. P1 Racine Wisconsin





## Monthly Market Review

THE FOLLOWING summary of the fruit marketing situation was furnished by the United States Bureau of Agricultural Economics on January 8:

"Prices have been tending generally higher since the beginning of the year. In fact, the general trend of fruit and vegetable markets has been upward since the middle of October.

"Winter markets are always alike in general style. Spells of severe weather check shipments and put prices higher in the cities. Then is the opportunity for growers on the farms nearby who can reach the market promptly. The high prices attract increased shipments and a decline follows until low prices or perhaps another storm or cold snap checks the movement to market. These moderate ups and downs comprise the history of the average season in winter. This year, the generally light or moderate production of those lines which go into winter storage tends to bring about repeated sharp upward moves. Whenever there is a let-up in new supplies, the whole market seems inclined to advance easily.

"Apple shipments are still fairly large. Oranges are coming to market in about the usual quantity

### Prices Strong

"Prices have been tending upward. Apple prices show little change on the average.

"While 1925 was not considered a year of heavy production, many crops have turned out well. Market activity has been stimulated by early maturity and high prices. Shipments exceeded last season in seven of the 14 leading fruits and vegetables and the combined total was three or four per cent larger than last season, despite the reduction of eight to 10 per cent in shipments of potatoes.

### Apple Market Slow

"The apple situation continues a little disappointing to those who had hoped for a sharp winter advance in prices. On the contrary, some of the standard lines have shown a slight tendency to sag away from the market level of the earlier months. Apart from the increase of 14 per cent in production compared with last year and the rather heavy supply in cold storage, the situation is as favorable as could be desired. The export trade has even exceeded that of last season. The consuming demand in domestic markets has been active. Some varieties have made an excellent showing, including Staymans, Yorks and others not produced heavily this year. Baldwins have lagged behind in general because of heavy production and the rather poor coloring of a considerable part of the crop. Some of the standard varieties of northwestern apples also have shown weakness during the past month or so with declines of 10c-25c in some markets. The movement from the producing sections in New York and Washington has been extremely heavy. Both states have already exceeded their totals of last season.

### Oranges and Grapefruit

"Shipments of oranges and grapefruit are considerably less than for last season thus far. Prices have been high and these fruits have not competed strongly with apples. The importance of the citrus fruits is often overlooked because of the comparatively light supply at any one time, but the long market season of the orange brings it to second or third rank of importance among fruits, following apples and grapes in number of cars shipped, while the grapefruit exceeds the strawberry in volume of shipments. The strawberry is doubtless one of the most popular fruits while it lasts, but the principal season is only about three months in length, while the grapefruit lasts practically throughout the year and its shipments mount up to very considerable figures. It is well adapted for long keeping and distant shipment and has been making some headway in the markets of Europe during the past few years."



## When You Use "Black Leaf 40" You Get Extra Insurance against Aphis—Kills both by Fumes and Contact

Take advantage of this two-fold control—when you spray with "Black Leaf 40" you kill Aphis, Thrips, Leaf Hopper, Psylla, Apple Red-Bug, etc., not only by direct contact (or hitting) but also because of the "gassing" effects of the volatile nicotine fumes which arise through the trees. For, when you mix "Black Leaf 40" with lime-sulphur, Bordeaux or calcium caseinate, or with soap alone, you convert the nicotine sulphate into highly volatile nicotine with powerful "gassing" properties.

Likewise, when you dust with Nicotine Dust, insects are killed by actual contact of the dust with their bodies and also by the powerful nicotine gas.

### "Ask Your Experiment Station"

TOBACCO BY-PRODUCTS & CHEMICAL CORP.

Incorporated

Louisville, Kentucky

# "Black Leaf 40"

40% Nicotine

Kills Aphis



### Budded from Bearing Trees

That's one of the secrets of Harrison Quality. Our apple and peach trees are budded from selected trees of superior quality. "Like produces like," you know. All Harrison trees are grown in our own nurseries, true-to-name and certified free from disease. We grade liberally and pack carefully. Our 1926 Fruit Guide gives many practical pointers on fruit-growing. Describes all the leading varieties of apples, peaches, pears, etc. Also small fruits and ornamentals. You should have a copy. It's free. Send today. Plan for bigger crops of better fruit.

**Harrison's Nurseries**  
"Largest growers of fruit trees in the world"  
Box 52 - Berlin, Md.



## GOOD SEEDS

**Grown From Select Stock—None Better**—56 years selling good seeds to satisfied customers. Prices below all others. Extra lot free in all orders I fill. Big free catalogue has over 700 pictures of vegetables and flowers. Send your and neighbors' addresses.  
**R. H. SHUMWAY, Rockford, Ill.**

A garden gives a "heap o' living"

## Planet Jr.



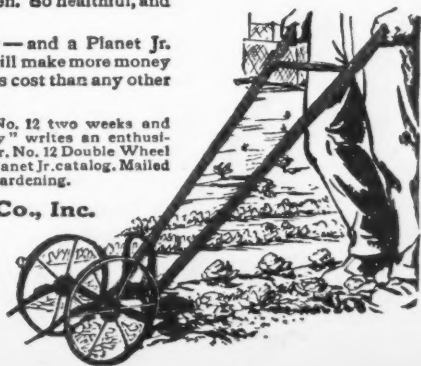
FRESH-PULLED CORN, smoking hot, smothered with golden butter! Juicy, ruddy-ripe tomatoes! Tender, melting peas! There's no end to the good things you can enjoy when you have your own garden. So healthful, and economical, too.

Have a garden this year—and a Planet Jr. Wheel Hoe to tend it. It will make more money for you in proportion to its cost than any other implement on the farm.

"Have had the Planet Jr. No. 12 two weeks and it has paid for itself already," writes an enthusiast. Read about this Planet Jr. No. 12 Double Wheel Hoe on pages 17-21 of latest Planet Jr. catalog. Mailed free with new handbook on gardening.

**S. L. Allen & Co., Inc.**

For 54 Years Largest Manufacturers of Specialized Field and Garden Implements in the World  
Dept. 26  
5th and Glenwood Ave.  
Philadelphia







## Aphis Deserts "Bridal Wreath" for Citrus; Its Attack Repulsed

IN THE spring of 1924 citrus growers in Florida discovered that their trees were being attacked by a new species of aphids or plant lice, which greatly exceeded any of the species heretofore known in its capacity for destruction. The insect was finally identified as *Aphis spiraeola*, an insect which heretofore had been known to attack only plants of genus *Spiraea*, which includes the common "bridal wreath." Why it suddenly attacked citrus is not known. During 1924 it spread rapidly over most of the citrus belt of the state, but most of the Satsuma belt escaped injury; although the insect is present throughout the Satsuma belt on *spirea*.

Confronted with this new and very destructive pest, the growers naturally turned to the experiment station and the state plant board for help. An intensive study was at once commenced, with the object of finding the weakest point in its life cycle, when control measures would be safest and most effective, and to discover what help was to be expected from its natural enemies.

The weak point in its life history was found to be the dormant periods of citrus, the most important of which is that of the early winter. It was found that groves which were cleaned up thoroughly of aphids in the early winter escaped with much less injury during the following spring. As a result of these studies the growers have been urged to do everything consistent with good grove practice to get the trees as dormant as possible during the winter. It has been found that it will not do to neglect this pest, especially on varieties which start late in the spring, like tangerines.

Nicotine sulphate-lime dusts have been found to be one of the most satisfactory means of control if applied during calm weather. Difficulty of finding ideal weather for dusting during the spring flush of growth has led to the devising of types of tents which can be used in windy weather on small trees.

Careful spraying has also been found effective if applied before any considerable number of leaves have been curled by the pest.

Intensive study has been made of its natural enemies, both insect and fungous, in an endeavor to ascertain what help may be expected from them. Certain fungous diseases have been found very effective if weather conditions are favorable for their growth. It has been found that the chief reason insect enemies of the aphid, principally lady-beetles and syrphus-flies, do not increase more rapidly is because they themselves are much attacked by other insects and fungous diseases. In an endeavor to find a lady-beetle which would be less susceptible to these diseases, a very large species has been introduced from California and several hundred of them are now on hand for liberation in the groves as soon as the aphids become abundant in the spring. —News Service, University of Florida.

## Bulletin on Controlling Japanese Beetle

BULLETIN 406 of the Pennsylvania Department of Agriculture, Harrisburg, Pa., describes a new method for holding the Japanese beetle in check.

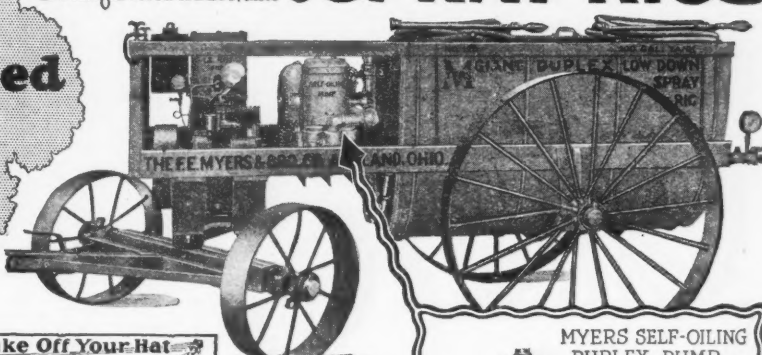
After several years of experimentation, it was found that a mixture of acid lead arsenate, ordinary baking flour and water gave the best results. This mixture, applied in the form of a spray, either repels the beetles which visit the trees or poisons those which feed heavily upon the sprayed foliage.

The bulletin gives general directions for spraying and describes in detail how to mix and dilute the materials for the spray. Definite directions are given for treating the beetle on various kinds of early and late fruit. The bulletin can be obtained free on request.

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Take Off Your Hat to the MYERS  
PUMPS - WATER SYSTEMS - HAY TOOLS - DOOR HANGERS

4 POPULAR STYLES OF MYERS EASY OPERATING COG-GEAR SPRAY PUMPS FOR HAND SPRAYING



FIG. 1862 NO. 296

FIG. 640 NO. 325



NOR336B

FIG. 1542 NO. 308C

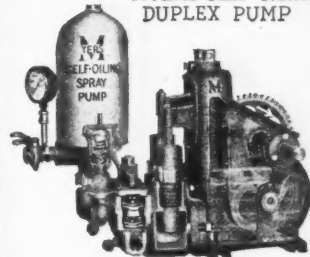
THE new day power sprayer is here—Myers Self-Oiling Power Spray Pumps now furnish maximum spraying efficiency at lowest possible cost. Positive self-lubrication, enclosed working parts, automatic control, high pressure safely maintained, powerful spray for guns or nozzles, minimum wear and breakage and other desirable improvements are popularizing Myers Self-Oiling Power Spray Pumps with fruit growers everywhere. Different styles and sizes meet all requirements.

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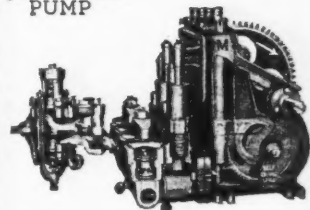
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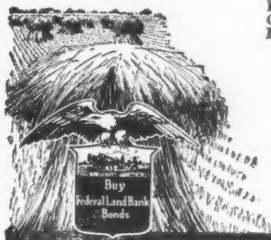
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OUR OFFER—Send us \$1.00 for a three years new, renewal, or extension subscription to the American Fruit Grower Magazine and we will send you three Concord grapes absolutely free. Order now—shipment will be made at proper time for planting.

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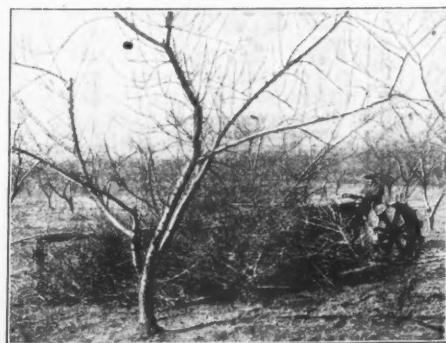
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I have.....acres in fruit



The modern way to clean up brush.

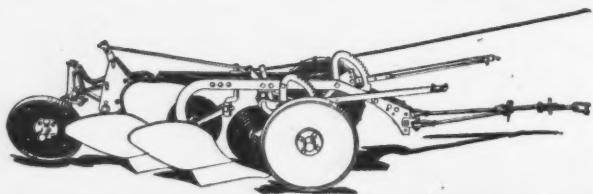
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Does the work in 1/5 of the time with 1/2 the men

Write for description, price and guarantee.

H. H. Bell & Sons, Manufacturers, Mt. Ephraim, N. J.

There never has been a John Deere implement discarded because the user couldn't get repairs.



## Here's Your Orchard Tractor Plow

A plow built especially to meet your needs. Gets under the limbs and up close to the row without barking the trees. It's the

### JOHN DEERE No. 45-A

When plowing 6 inches deep the No. 45-A is only 26 inches high. Levers operate opposite to the ordinary plow—they are down when the plow is at work.

The width over all is only 37 inches, and the adjustable hitch permits offsetting plow either to the right or left of the tractor. You can work the plow right up to the trees, throwing to or from the row.

You can use the No. 45-A with equal satisfaction as a field plow.

You get high quality of plowing with the 45-A—the kind of plowing that has made John Deere plows famous as better seed bed makers for more than three-quarters of a century.

Before you buy an orchard plow be sure to know all about the John Deere No. 45-A. See it at your dealer's.

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Booklet that describes many other important features on the No. 45-A and also a farm account book, "Bookkeeping on the Farm." Write today to John Deere, Moline, Ill., and ask for booklets 60-61

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THE TRADE MARK OF QUALITY MADE FAMOUS BY GOOD IMPLEMENTS

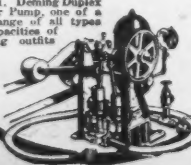


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Fig. 761. Deming Duplex Plunger Pump, one of a wide range of all types and capacities of spraying outfits.



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Box 1226 Three Rivers, Mich.

## Spraying Calendar for

By Laval S. Morris,

### APPLES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Codling moth.	Arsenate of lead, 3 lbs. to 100 gals. water.	(1) Immediately after petals fall. (2) Ten days to 2 weeks later. (3) One month later. (4) Spray later if necessary.	The powdered arsenate of lead is preferable. If the paste is used, double the amount stated. Keep in touch with crop inspector as to time of spraying.
San Jose scale and Putnam's scale.	Lime-sulphur, 1 to 8, or miscible oil.	In spring before buds open and in autumn after leaves fall.	Severely infested old trees should be removed. If insects are bad in summer, they may be partly checked by light kerosene emulsion.
Oyster shell scale.	Concentrated tobacco solution, 2 pts. to 100 gals. water, or 15% kerosene emulsion.	In spring when eggs are hatching.	Treatment for San Jose scale will perhaps control many of these insects. Infested nursery stock should be rejected.
Fruit-tree leaf roller.	Miscible oil for eggs. Arsenate of lead, 6 lbs. powder to 100 gals. water for larvae.	Miscible oil in early spring. Lead arsenate when buds are opening.	Codling moth spray helps. Do not spray when trees are in blossom as honey bees are injured.
Green apple aphid.	Prune infested shoots. Spray with tobacco extract, 2 pts. to 100 gals. water.	When insects appear and before leaves curl. Prune after leaves curl.	Kerosene emulsion and soap solution are recommended also.
Apple curculio.	Destroy hibernating places. Cultivate soil. Arsenate of lead, 3 lbs. to 100 gals. water.	Spray after petals fall.	The spray for codling moth will control this insect. In some cases it will be well to destroy wild hawthorns.
Apple leaf hopper.	Nicotine sulphate, 1 pt. to 100 gals. water. Dip nursery stock in soap solution.	Early in season before wing stage appears.	The insects stay under surface of leaves; therefore, hit the under surface with spray.
Bud moth.	Arsenate of lead, 3 lbs. to 100 gals. water.	When buds are bursting.	This insect has been reported in the northern end of the district only, but it is spreading.
Leaf blister mite.	Lime-sulphur, 10 to 100. Miscible oil, 6 1/2 to 100.	Dormant season until buds open.	This insect lives under a blister on the leaves and cannot be controlled in the summer.
Apple-tree borers.	Keep trees vigorous. Dig larvae out before they enter the heart wood. Prevent egg laying on trunks by painting with pure white lead and linseed oil.	Paint before June 1.	Carbon disulphide may be effective if injected into holes and the holes then plugged.
Fire blight.	See Fire Blight under pears.		This disease does more damage on pears; however, much damage was done to apple spurs during 1925.
Blue mold.	Avoid bruising and wounding apples. Do not pile apples in storage. Keep temperature low (30-33 degrees Fahrenheit) in storage.	When picking and storing.	Blue mold is a storage disease, and does much damage under improper conditions.
Apple scab.	Lime-sulphur, 1 gal. to 40 gals. water, or copper sulphate, 4 lbs. to 45 gals. water.	Just before buds open.	This disease is not very troublesome in the Rocky Mountain region because of dry climatic conditions.

### PEARS

What to Spray For.	Treatment.	When to Treat.	Remarks.
Pear or cherry slug.	Arsenate of lead, 3 lbs. to 100 gals. water. Nicotine sulphate, 1 part to 800 parts water.	When insects appear.	Due to the delicate covering of this insect, it can be controlled by contact sprays as well as stomach poisons. Codling moth spray is usually sufficient.
Codling moth.	Same as for apples.		
San Jose scale.	Same as for apples.		
Leaf blister mite.	Same as for apples.		This insect is very bad on pears some years.
Fire blight (pear blight).	Prune out all infected branches, making cuts a few inches below darkened area. Sterilize pruning tools and wounds with mercuric cyanide, 1 part to 1000 parts of water by weight. Avoid too rapid growth of trees by proper cultural methods.	In winter and in summer when infected branches are observed.	This disease has exterminated many Bartlett pear orchards in this region. Planting resistant varieties is recommended. Large branches may often be saved by cutting out lesions which do not reach the cambium and sterilizing with mercuric cyanide.

### PEACHES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Peach tree borer.	Apply paradichlorobenzene at base of tree, 1 oz. per tree. If tree is younger than 6 years, use less material.	Early September.	This treatment has superseded the method of digging out the larvae or the shielding of the trunks with paper and wire.
Peach twig borer.	Lime-sulphur, 1 to 9. Arsenate of lead, 3 lbs. to 100 gals. water.	Use lime-sulphur in spring before buds burst. Arsenate of lead as buds are bursting and as fruit is maturing if insects are numerous.	Trees kept in vigorous condition are not much bothered.
Green peach aphid.	Tobacco solution, 2 pts. to 100 gals. water.	As soon as insects appear in spring or early summer.	This insect spreads to other crops, hence it is important to spray before migration.
Black peach aphid.	Dip nursery stock in strong tobacco solution. Spray leaves with tobacco solution. Apply tobacco solution or tobacco dust at base of tree and on exposed roots.	To nursery stock when planted. Spray leaves when aphids appear. Treat roots in early summer.	This insect does most damage to the roots. Some, however, attack the leaves during the early growing season. Tobacco dust is effective on moist soil but not on the leaves.
California peach blight.	Prune cankers out. Lime-sulphur, 1 to 8 (dormant). Bordeaux mixture, 6-6-50, or lime-sulphur, 1 to 40.	Prune in spring and as cankers appear. Spray as soon as harvested and early in spring.	This disease is prevalent in a few places only.
Peach leaf curl.	Lime-sulphur, 1 to 8.	Before buds open in spring.	It is seldom necessary to spray for this disease.

THE FEDERAL Horticultural Board has found it necessary to impose strict inspection of fruit products in Hawaii due to the danger of introducing into the United States the Mediterranean fruit fly and other dangerous

insects. An idea of the scope of the inspection work in Hawaii is indicated by the fact that 210,000 bunches of bananas, 14,000 crates of pineapples, 5000 crates of taro, over 800 crates of coconuts, 983 crates of lily root, and

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Strawberry r  
aphid.

White grubs.

Chlorosis (ye  
leaves).

What to Spr  
For.  
Grapevine l  
hopper.

Downy mildew

Downy gall.

Dead arm.

Phylloxera.

What to Spr  
For.  
Buffalo tree  
per.

Woolly a  
(plant lice).

Grasshoppers  
crickets.

Clover mite.

Red spider.

Tent caterpillars

Powdery mildew

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# for Rocky Mountain District

Brigham Young University

## CHERRIES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Cherry or pear slug.	See pear insects.		This insect is extremely injurious, but is easily controlled. The cherry slug should receive special attention at present.
Black cherry aphid.	Treat same as black peach aphid.		It is sometimes advisable to prune out colonies on shoots.
Shot hole disease (leaf blight).	Lime-sulphur, 1 to 50.	After the fruit has set.	This disease is not serious in the Rocky Mountain district.

## PLUMS

What to Spray For.	Treatment.	When to Treat.	Remarks.
Pear or cherry slug.	See pear insects.		Plums are practically free from pests in this district.

## APRICOTS

What to Spray For.	Treatment.	When to Treat.	Remarks.
Peach twig borer.	See peach insects.		

## STRAWBERRIES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Strawberry leaf roller.	Arsenate of lead, 3 lbs. to 100 gals. water.	When adult moths appear in spring.	If pest is very troublesome, cut vines and burn after crop is harvested.
Strawberry crown borer.	Rotation of crops. Plow up patch when badly infested.	After crop is harvested.	In some cases it is advisable to plow up patch after first crop. If insects are not numerous, the patch may be left 3 or 4 years.
Strawberry root aphid.	Scatter straw over plants in early spring and burn. Plow up old infested patches.	After eggs hatch and aphid appear in spring.	Proper rotation of crops will keep this insect fairly well in check.
White grubs.	Proper crop rotation.	When necessary.	There is no means of control by spraying or addition of chemicals. If grubs are bad, strawberries should not follow sod.
Chlorosis (yellow leaves).	Plant in soil that does not cause leaves to turn yellow.		The cause of chlorosis is not definitely known. It may be due to many things.

## GRAPES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Grapevine leaf hopper.	Nicotine sulphate, 1½ pts.; 50 gals. water; 2 lbs. soap.	Early spring.	Sanitation in cultural methods is very important.
Downy mildew.	Spray with Bordeaux mixture 5-3-50, or dust with sulphur dust.	Just before blossom buds open.	This disease is seldom virulent in this district. It is very seldom necessary to spray.
Grown gall.	Prune out and burn infested branches. Plant resistant varieties.	Prune during dormant season.	This disease attacks chiefly the European varieties.
Dead arm.	Prune out infested branches. If badly infested, remove vines. Take cuttings from disease-free vineyards.	During growing seasons when effects of disease can be observed.	In pruning, the cuts should be made some distance below infested area. If disease becomes bad, spread may be checked with Bordeaux mixture.
Phylloxera.	Graft European varieties on American stocks.	If phylloxera is bad, grafting should be done before establishing the vineyard.	In many cases the phylloxera is not bad enough to bother with.

## INSECTS THAT FEED PROMISCUOUSLY

What to Spray For.	Treatment.	When to Treat.	Remarks.
Buffalo tree hopper.	Clean cultivation. Burn pruned wood.	Cultivate in early spring so as to keep all weeds down. Prune and burn wood in early spring.	This insect does damage to fruit trees by making punctures in which to lay eggs.
Woolly aphid (plant lice).	Nicotine sulphate, 1 pt. to 100 gals. water, or 15% kerosene emulsion.	When aphids appear in spring and before leaves curl.	In some cases it may be well to prune out infested shoots, after leaves curl.
Grasshoppers and crickets.	Tear up breeding grounds with disk or spring tooth harrow. Scatter arsenic-brown mash in infested fields.	When they become numerous.	Traps may be used to good advantage some years.
Clover mite.	Lime-sulphur solution. Same as for San Jose scale.	During dormant season.	San Jose scale treatment destroys the eggs of this mite. It feeds on clover and various fruit trees.
Red spider.	Concentrated tobacco solution, 2 pts. to 100 gals. water, or clear cold water.	When spiders first appear.	It is effective to use 3 lbs. of soap per 100 gals. of spray. Cold water is sometimes effective; however, tobacco solution is most dependable.
Teat caterpillar.	Prune out and burn tent masses. Arsenate of lead, 3 lbs. to 100 gals. water.	In early growing season when caterpillars appear.	These insects are fairly well controlled by natural enemies.
Powdery mildew.	Lime-sulphur 1 to 8. Prune and burn infested shoots. Bordeaux mixture.	In dormant season. In summer as disease appears. In summer.	This is the only important disease that attacks various plants.
San Jose and Pann's scale.	See apple pests.		

# TREE TANGLEFOOT



## PROTECTS

Orchards, Vineyards & Shade Trees  
Against Climbing Insect Pests

**C**limbing insects cannot cross a band of Tree Tanglefoot—a sticky material applied in narrow bands to the trunks of trees and grapevines. It is especially recommended against Climbing Cutworms, Canker Worms, Gypsy, Brown-tail and Tussock Caterpillars and Ants.

### Outlasts all Substitutes

One pound makes 12 lineal feet of band three-inches wide. It remains effective three to four months—outlasting all substitute materials from 10 to 20 times.

Tree Tanglefoot is quickly and easily applied with a wooden paddle. For tree surgery nothing equals this material. It waterproofs crotches, wounds and cavities when nothing else will. Leading horticulturists everywhere endorse it. Seed, hardware and drug stores sell it. Prices: 25-lb. pail \$11, 10-lb. can \$5.25, 5-lb. can \$2.75, 1-lb. can 60 cents.

## THE TANGLEFOOT COMPANY

GRAND RAPIDS, MICHIGAN

Orchard Supply Company

Sacramento, Calif.

(94)



In Vineyards Always  
Apply Tree Tanglefoot to  
Posts, or Wires on Each  
Side of Them, When  
Banding Vines

26 crates of ginger root were passed for shipment into the United States during the past year. Only 315 packages were rejected as unfit for shipment. About 1400 permits were issued to shipping companies. In addition to inspecting the products, the board makes very careful inspection of the baggage of passengers so that there may be no danger whatever of the fruit fly and other pests being carried into the United States.

Mr. Nofsinger writes,

**"I would not use anything else"**

ALTA ORCHARDS, near Baltimore, Md., grow fancy fruit for the discriminating trade of a list of about 2000 automobile customers. They sell quality fruit—and it brings quality prices.

This is what Mr. Nofsinger, the owner, says about the use of Arcadian Sulphate of Ammonia on his orchards:

"I am very glad indeed to tell you about my experiences with Sulphate of Ammonia as a fertilizer in my orchard.

"The first I used was a small amount brought out to me for trial by your representative in Baltimore. This was in the spring of 1920. Excellent results followed its use on both the peach and apple trees to which it was applied, and I was convinced it would pay me to use it over my whole orchard next year.

"Beginning with the spring of 1921, I have used Sulphate of Ammonia as the nitrogenous fertilizer over my entire orchard and have been more than pleased with the results. I would not use anything else."

Mail the coupon for free bulletins.

## ARCADIAN Sulphate of Ammonia

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THE BARRETT COMPANY (address nearest office)

Please send me sample package of Arcadian Sulphate of Ammonia.

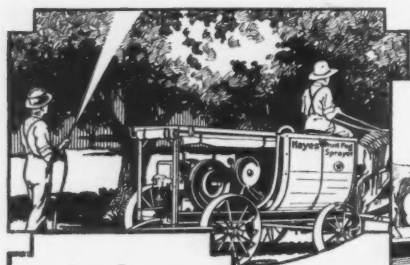
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POWER  
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SPRAYERS

Hayes Triplex Model. Automobile type construction, pump cast in a single block, gives greater strength, less weight and fewer parts. 300 pounds guaranteed pressure. Delivers 8 to 15 gal. per min. Completely equipped, 300 gal. tank, truck, hose and guns. Porcelain cylinders optional. Write for prices.

## FRUIT-FOG



## Hayes Fruit-Fog Sprayers Reduce Spraying Costs

Economy in spraying is possible only with efficient spraying equipment. A sprayer that saves on time and labor at the expense of thoroughness actually costs you more money. To be efficient, a sprayer must combine speed and thoroughness, mechanical excellence and low operating cost.

### Hayes Fruit Fog Sprayers are truly efficient.

Guaranteed high pressure and large capacity cut your time and labor expense just as mechanical perfection assures low operating costs. Fruit Fog requires less solution and wipes out your losses by killing pests that other sprays cannot reach.

Investigate the Hayes Sprayer line. It includes 50 different models—one or more of which will exactly fit your requirements. New sprayer folder just off the press sent free upon request. Send for your copy today.

Hayes Pump & Planter Co.  
Dept. 09, 809 Sixth St., Galva, Ill.

## Profitable Poultry



By H. A. Bittenbender

## Feeding Baby Chicks

NO PHASE of poultry work requires closer attention or more information than feeding baby chicks. A chick just emerging from the shell requires a proper temperature and correct feeding. Failure to supply either will result in poor birds later on. Baby chicks are delicate little creatures and should be handled as tenderly and faithfully as a new born babe.

### Equipment

For each 50 chicks you will need a two-foot mash hopper and a suitable fountain.

### Tempering the Baby Chick

Between the time chicks are hatched and when they are placed under the hover, one of the best homes for them is in chick boxes, provided with sufficient air openings to conform to the temperature of the room where they are kept. A chick box keeps them warm and comfortable, and they will be more quiet in a dark place than in a light room. The first two days a chick is better off to be quiet and sleeping than running around.

The yolk sac is absorbed or drawn into the intestinal cavity shortly before hatching, and it provides the proper food for the chick for the first 48 to 72 hours. This yolk should be mostly absorbed before any food is given.

### Culling

Carefully examine each chick when removing from the incubator or chick box and retain only the strong, vigorous chicks. Chicks with crooked beaks, deformed feet, runty bodies, or evidences of the yolk not being properly absorbed should not be placed under the hover. They will not respond to feed and care in a satisfactory manner and had best be rejected at the very beginning.

### Feeding

Heinz has 57 varieties of pickles, and there are probably 500 more ways of feeding baby chicks than there are pickle concoctions. There is no one best way of feeding, and if you have had success following a certain way and can produce a two-pound bird in from nine to 11 weeks, we suggest you continue as you have been. If you have not been able to equal these results, then we urge that you try the method of feeding described in this article.

Before taking up the method of feeding, a slight review of various feeds used may prove of benefit:

Roller oats or oatmeal are extensively used and are a wonderful feed. Steel cut oats are preferred by some to the roller, and being somewhat smaller are easier for the chick to pick up. However, they are harder and not as easily digested.

Good yellow corn is very important in the mash and when cracked to the proper size should be used to quite an extent in the grain ration.

Milk is both food and drink combined in one. It should always be fed in sour or clabbered form. A safe rule with milk is to feed today's milk tomorrow. If liquid milk is not available, commercial milk products should be purchased in the dry or paste form. Feed the milk in earthen or enameled vessels. They are easier to clean, and cleanliness is a big factor where milk products are fed. Wash milk vessels every morning and scrub and scald at least twice a week. Where sour milk can be had, no water should be fed to the chicks for the

first six weeks. Sour milk should constitute their entire drink during this time.

Wheat is excellent for a portion of the grain feed. It can be ground and used in the mash, but some of its by-products, such as bran or middlings, appear to be more in favor. Ground wheat is too heavy and sticky for the best results.

The food value of bran is not of as much importance as is the fact that its bulky nature allows the digestive juices to reach all particles of food.

Standard middlings seem to prove very valuable in a chick mash. The nutritive ratio is good, and fiber content is not excessive.

Meat meal or meat scraps are found in most mashes and will give good results as the chief source of protein, but better results are obtained where both milk and meat products are used. Be sure these foods are fresh and sweet.

Eggs tested out of the incubator up to the fourteenth day will show remarkable results when properly used. The general practice is to boil the eggs for at least 30 minutes; then use the entire egg, shell and all, to feed to the chicks. Mix with the grain to be fed after it is thoroughly mashed.

Minerals are important and should include limestone, bone meal and charcoal.

Baby chicks relish and respond to green food. Dandelions are one of the earliest forms of nature's green food, and the chicks enjoy it. Cabbage leaves, lettuce waste, alfalfa leaves, germinated wheat and tender short sprouts of sweet clover and alfalfa are good.

The following feeding schedule and mash formulas are suggested for a chick ration. It is based on giving the chicks no water to drink, their thirst being supplied by sour milk or buttermilk for the first six weeks.

As each chick is placed under the brooder, dip its bill in the milk. It is well to take the chicks out in the morning so they can be watched the first eight or 10 hours.

The feed for the first three times should consist of rolled oats eight parts, and hard boiled egg one part, thoroughly mixed. The feeding schedule given below calls for feeding this grain mixture five times daily.

### Suggested Feeding Schedule FIRST THREE DAYS.

Grain—  
Fed five times daily for three days:  
Rolled oats..... 8 parts  
Hard boiled egg..... 1 part

Mash—  
Mash to be started on the third day.

### THREE TO 10 DAYS.

Grain—  
Same as above, but fed three times daily.

Mash—  
Fed twice daily. Start with 30-minute period and gradually increase.

### Formula.

	Pounds.
Corn meal.....	25
Standard middlings.....	25
Oat flour (hulls removed).....	25
Dried buttermilk or meat scraps.....	15
Ground limestone.....	4
Bone meal.....	3
Charcoal.....	3

### TEN DAYS TO SIX WEEKS.

	Pounds.
Grain— Three times daily:	
Fine cracked corn.....	33
Steel cut oats.....	33
Whole wheat.....	33

Mash—  
Full feed in hoppers.  
Same formula as before.  
(For broilers continue the above grain and mash until marketed.)  
(Concluded on page 53)



# What the owners say



Rochester Rex Co., Inc.  
172 Monroe Ave.,  
Rochester, N. Y.

Gentlemen:

I take pleasure in writing this letter of recommendation for your Liqui-Duster which I have used this past season.

When I purchased your machine I was in doubt as to whether it would do what was claimed for it, but, when the first tank was sprayed, I was fully convinced that your claims were very conservative. After familiarizing myself with the machine the speed and easiness of application increased and my spraying was done with unparalleled speed and thoroughness. Comparative figures show a saving of 35% on material and 50% in labor.

I was somewhat skeptical of the small amount of material being used but upon making a thorough examination I found the material was being evenly distributed on the trees and foliage. The under sides of the leaves were thoroughly covered due to the high velocity of the air and the fineness of the spray. The quality of my fruit proved to me this was my most successful season of spraying in my forty years of growing fruit.

Yours very truly,

*John La Garree*

"THE REX Liqui-Duster which I purchased from you has exceeded your claims and my expectations, in that it has saved me approximately 40% on my material as well as one-half the labor based on comparison with past seasons when I used a high pressure sprayer."

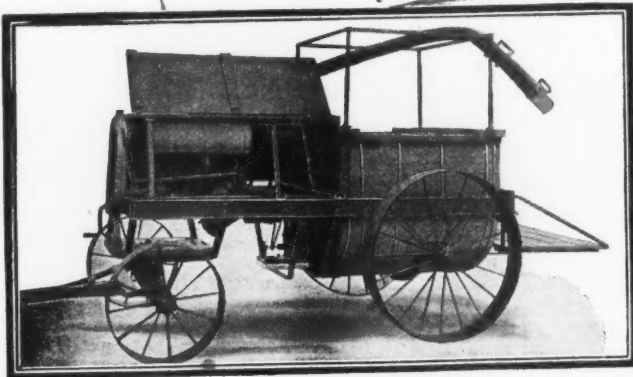
The above is a paragraph taken from a letter written by M. E. Hosmer of Youngstown, N. Y. Now read John La Gasse's letter on the left, a typical example of what REX Liqui-Duster owners are saying.

## High Air Velocity Is the Answer

Small wonder, however, that the owners are enthusiastic about this King of Sprayers, for the REX Liqui-Duster has revolutionized spraying methods. Now you can spray with **only eight ounces of pressure per square inch. High air velocity is the answer.** A fine mist is fanned—not forced—through a short Pipe, four inches in diameter, by a 14" Fan. A Gould Centrifugal Pump is driven by a standard Ford Motor. Spray guns, hose, and nozzles have become obsolete along with the pump of 250 to 400 pounds pressure. For complete information on the King of Sprayers write us today.

### A SPECIAL MESSAGE TO DEALERS

The REX Liqui-Duster is becoming one of the fastest selling sprayers on the market. This desirable franchise is offered to responsible dealers throughout the United States. Write us for our attractive proposition



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172 Monroe Avenue  
Rochester, N. Y.

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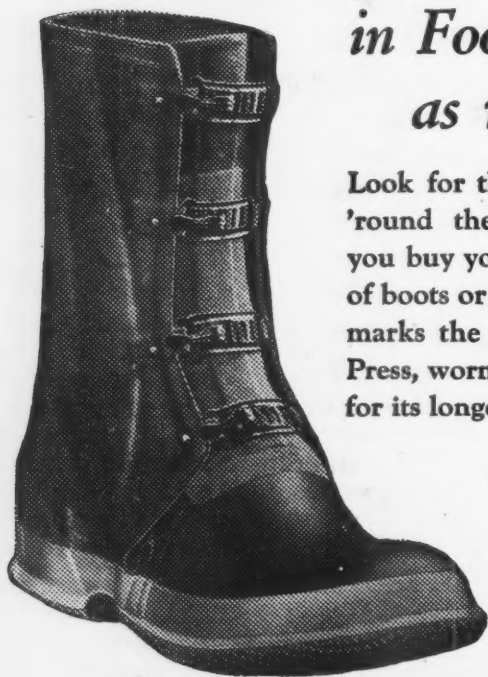
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THE B. F. GOODRICH RUBBER COMPANY, Akron, Ohio

## Spray Schedule for New England

By Brooks D. Drain,  
Massachusetts Agricultural College

### APPLES

Time of Application.	Materials Used.	Enemy.	Remarks.
(1) Delayed dormant. Early spring as buds are breaking.	Lubricating oil emulsion, 4 to 5 gals.; water to make 100 gals. (3% actual oil) or lime-sulphur, 12 gals.; 40% nicotine sulphate, 3 pt.; water to make 100 gals.	San Jose scale, European red mite (eggs), aphids, blister mite.	Lubricating oil emulsion is cheaper than lime-sulphur and is more efficient in controlling European red mite.
(2) Pre-pink. Before the clusters of blossom buds separate.	Lime-sulphur, 2 gals.; water to make 100 gals.	Apple scab.	Used on McIntosh and other varieties subject to scab. Very effective when weather conditions are bad at this season.
(3) Pink spray. As blossom buds begin to show pink.	Lime-sulphur, 2 gals.; dry arsenate of lead, 3 lbs.; nicotine sulphate, 1 pt.; water to make 100 gals.	Red bug, scab, curculio, aphids, tent caterpillar, bud moth, brown tail moth, gray moth, canker worms.	In areas where the gray moth is troublesome, the amount of arsenate of lead is doubled. This is a very important spray in New England.
(4) Calyx. Within a week after the petals fall.	Same as pink spray.	Codling moth, curculio, scab, red bug, aphids, gray moth, skeletonizer.	Generally regarded as the most important single spray.
(5) About July 1.	Same as pink spray except no nicotine sulphate.	Railroad worm, Brooks spot, sooty fungus, scab, skeletonizer.	Especially important in the control of railroad worm. Special sprays a and b, noted below, are often substituted for this application where railroad worm has not been common.

### NOTES

1. Special Sprays.—The following special sprays are sometimes applied in addition to those listed above, or one or more of them may be substituted for No. 5:
  - a. Where plum curculio is serious on apples, a spray of arsenate of lead, 3 lbs. to 100 gals., is applied a week or 10 days after the calyx spray. This is also effective against late emerging codling moth. If scab is developing, 2 gals. lime-sulphur is added.
  - b. In seasons or localities where sooty fungus is expected to be serious, a spray of lime-sulphur, 2 gals. to 100, is made about the last of July or 2 months after the calyx spray.
2. Dry lime-sulphur is being commonly used by small growers because of its convenience in handling.
3. Dust is not very generally used with apples in New England.

### PEACHES

Time of Application	Materials Used.	Enemy.	Remarks.
(1) Dormant spray. Applied in late autumn or early spring before buds begin to swell in the least.	Lime-sulphur, 7 gals.; water to make 100 gals.	Leaf curl.	If San Jose scale is present, use 12 gals. lime-sulphur instead of 7.
(2) When blossoms show pink.	Dry-mix sulphur lime, 25 lbs.; water to make 100 gals.; or self-boiled lime-sulphur, 16-16-100.	Brown rot.	Sulphur dust may be used for this application.
(3) When the shucks are falling.	Same as No. 2, together with 3 lbs. arsenate of lead.	Brown rot, curculio, scab.	The most important single spray. Sulphur-arsenate of lead dust may be used.
(4) Ten days or 2 weeks after No. 3.	Same materials as for No. 3.	Curculio, scab, brown rot.	Sulphur-arsenate of lead dust, 85 to 15, may be used.
(5) Three or 4 weeks after No. 4.	Dry-mix sulphur lime, 25 lbs.; water to make 100 gals.; or self-boiled lime-sulphur, 16-16-100.	Brown rot, scab.	Should not be used on early ripening varieties. Sulphur dust may be used.

### PEARS

Time of Application.	Materials Used.	Enemy.	Remarks.
(1) Cluster bud spray. As the blossom buds are separating in the cluster.	Lime-sulphur, 12 gals.; water to make 100 gals.	Paylla (eggs), San Jose scale, scab, blister mite.	Very important in paylla control.
(2) Calyx spray. Just after petals fall.	Quick lime, 40 lbs.; copper sulphate, 2 lbs.; dry arsenate of lead, 3 lbs.; nicotine sulphate, 1 pt.; water to make 100 gals.	Codling moth, scab, paylla, curculio, leaf spot, false tarnished plant bug.	Most important single spray.
(3) Three to 5 weeks after calyx spray.	Same materials as for calyx spray.	Paylla, scab, sooty fungus, codling moth, other leaf-eating insects and fungous diseases.	

### SPECIAL SPRAYS

1. A special spray should be applied for blister mites when they are abundant. Use the same materials as for the cluster bud spray and apply before the buds break. Miscible oil is sometimes used in place of lime-sulphur, when European red mite eggs are present.
2. An emergency spray for paylla to be applied when the nymphs become abundant. This is likely to occur almost any time during the growing season. Use same materials as for calyx spray.

### PLUMS (Japanese Varieties)

Time of Application.	Materials Used.	Enemy.	Remarks.
(1) Just as shucks begin to fall.	Dry-mix sulphur lime, 25 lbs.; or self-boiled lime-sulphur, 16-16-100; dry arsenate of lead, 3 lbs.; water to make 100 gals.	Brown rot, curculio, leaf spot.	Sulphur-arsenate of lead dust may be used.
(2) Ten days to 2 weeks after No. 1.	Same materials as for No. 1.	Curculio, brown rot, leaf spot, skeletonizer, mildew.	Important in curculio control.
(3) About July 1.	Same materials as for No. 1.	Same as No. 2.	
(4) Two to 4 weeks after No. 3.	Dry-mix sulphur lime, 25 lbs.; or self-boiled lime-sulphur, 16-16-100; water to make 100 gals.	Brown rot, leaf spot, mildew.	Should not be used on early ripening varieties.

### NOTES

1. If European red mite eggs and San Jose scale are present, a special spray of lubricating oil emulsion, 4 to 5 gals. to 100 gals. of water, should be applied when the trees are dormant.
2. Lime-sulphur, 2 gals. to 100 gals. of water, may be substituted in place of the dry-mix or self-boiled lime-sulphur with European varieties of plums.



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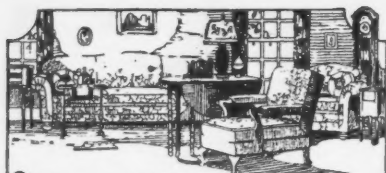
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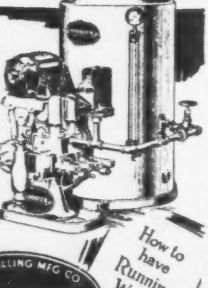
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## CHATS WITH FRUIT GROWER'S WIFE

By HAZEL BURSELL



## Secrets of Good Flavor

"UPON seasonings and flavorings rests the whole structure of good cooking," says one recognized food authority. She further says that the average list of seasonings includes only salt, pepper, paprika and a few spices.

In reality there are hundreds of seasoning and flavoring agents, which can be roughly classified into several groups. Among the herbs we have sage, marjoram, thyme, tarragon, penny-royal, dill, bay leaf, rose geranium leaf, lemon verbena, anise, mint and parsley. Certain plants produce seeds that have come to be popular flavoring agents, such as caraway seeds, coriander seeds, poppy seeds, celery seeds and nasturtium seeds.

### Spices Are Listed

Spices that should be on the shelf in every kitchen include cinnamon, cloves, nutmeg, ginger, mace, allspice, mustard, tumeric powder and curry powder. Then there is the "salt and pepper" group, consisting of table salt, black and cayenne peppers, paprika, onion salt and celery salt. Vinegar and sugar are also indispensable flavoring agents.

We must not forget the dried fruits that are used to lend flavor and richness to many cookies, cakes, breads, pies and puddings. Under this classification come raisins, currants, candied citron, dried prunes, candied orange and lemon peels, candied and Maraschino cherries, and various preserves, marmalades and jellies. Vegetables with zest and flavor are used to bring out desirable flavors in other vegetables, meats, sauces, salads and soups. Onions, green peppers, pimentos, olives, celery, tomatoes, garlic, chives, pickles and shallots are those commonly used as this type.

Butter, cream and cheese are usually regarded as foods in themselves, and so they are, but they are also most important as flavoring agents. Bacon and ham, or the fat from them, or beef broth often will give just the desired flavor. Where would we be in vegetable cookery without them?

The extracts and essences form still another class. All the fruit flavors, including lemon, orange, raspberry and banana, are on the market. Certain flower flavors, such as rose, violet and rose geranium leaf, are used occasionally in pastries, candies and icings, but these are very concentrated extracts and a few drops will flavor a large amount of icing or candy. Vanilla is made from the oil of the vanilla bean. Chocolate and cocoa are made from another type of tropical bean. Coconut and almond extract are representatives of the flavors from nuts, although all types of chopped nuts are used in salads and pastries.

### Season According to Taste

On the cook's ability to use these seasonings and flavorings to advantage will depend her success in the art of cookery. The foregoing list affords unlimited possibilities to the woman, or man (there are men cooks and very fine ones, you know), who has the fundamental knowledge and the inclination to experiment. The real chef scoffs a stilted recipe when it comes to flavors and seasonings—he builds on the foundation little by little, through the addition of this and that and by constant tasting, until he achieves some unusual and at the same time wholly pleasing flavor. The French are unexcelled in cookery and they have won the world's acclaim solely because they have perfected the art of flavoring.

A knowledge of the flavorings and their use will give the housewife a tremendous advantage over the woman who has not this knowledge. She can without fail achieve variety in her menus with a small assortment of fruits, vegetables and meats because of her ability to bring out different flavors at each serving. The humblest stew becomes a dish fit for a king when she turns it out. She can use cheaper foods and still serve more appetizing meals than the ordinary cook, thereby saving money. The cook who can season and flavor foods "differently" never has to throw out leftovers. Flavorings are an aid in digestion, contrary to some opinion, because they stimulate the flow of digestive juices.

### Develop Natural Flavor

The first rule of seasoning is to develop and bring out the natural flavor of the food, whether fruits, vegetable or meat, then to add some herb or spice that, while still allowing the natural flavor to dominate, gives it a "different" touch. Some foods, such as coffee, peanuts and meats, are improved in flavor by fire and heat. In their case the "roasted" flavor is an improvement on the "natural" flavor. So we see that fire is an agent in flavoring. Some authorities state that the best "roasted" flavor is achieved over an open fire of hardwood.

We are all familiar with the uses of onion as a flavoring agent, so that need not be gone into here. Garlic is the "strongest" member of the onion family, but it imparts a zest, if properly used, in certain salads and meats that nothing else can. For salads, merely rub the inside of the bowl with a peeled clove of garlic. A bit of garlic will give a pleasing flavor when added to bread dressing for roast lamb or veal. Some cooks pierce their roasts of beef or lamb when half done and insert a bit of garlic. Occasionally the steak platter may be rubbed with a cut clove. Garlic should not be used frequently as it has too pronounced a flavor.

Chives, leeks and shallots are all milder flavored members of the Tribe of Onion. Chives are excellent as a flavor for all kinds of soups, stews, salads and sauces. They also impart a zest to French dressing when chopped fine.

### Parsley Family Useful

There are several members of the parsley family also, including chervil, anise, dill and the ordinary parsley. Chervil is worth trying as it will add much to the flavor of veal stews, salads, soups, and sandwiches. Anise is a fragrant seed used chiefly as a spice. Dill's well-known use is in the making of dill pickles. Parsley makes a lovely garnish for meats and vegetables and gives a desirable flavor in soups, meat dressings, salads and sauces.

Marjoram and penny-royal are of the mint family and, as such, have strong, minty flavors. Watercress, a member of the mustard family, is liked for its pungent flavor in salads and sandwiches. Thyme consists of the dried leaves of a small shrub, growing six to 10 inches high. Thyme has a spicy, aromatic odor, as has the bay leaf. Both are excellent in tomato sauces, catups, pickled beets, and chopped pickles, such as chow chow. The bay leaf may be picked off certain laurel trees in the southern states and dried for future use. Tarragon is a perennial European herb cultivated for its aromatic leaves. It is used in salads and

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In the preparation of tarragon vinegar. Sage comes into its own in sausage, pork chops, and in stuffings for fowl. Caraway and coriander seeds are used in cakes, cookies and confections. Poppy seeds, when sprinkled on the top of rolls and breads before baking, lend a most pleasing "nutty" flavor. Celery and nasturtium seeds (nasturtium seeds but sparingly) are used principally in chopped and cucumber pickles.

The ordinary spices and their uses need no discussion here. However, it will be interesting to note the origin of some of them. The clove is the unexpanded, dried flower of a small evergreen tree of the myrtle family. Turmeric, used mostly in pickles, and outstanding because of its intense yellow color, is made by drying and powdering the tuber of the turmeric shrub. Mace comes from the same plant as do nutmegs, and is used in much the same manner. Ginger is the hot and spicy root of the ginger plant ground to a powder. It is used chiefly in cookies, fruit cakes, gingerbreads and pumpkin pies. Curry powder is a powdered condiment with a pungent flavor. It finds its chief use in curry sauce, as a seasoning in lamb curry, and in certain chopped pickles.

Nose Identifies Flavor

The diner determines the "flavor" of his food by both the smell and the taste. The tongue is the organ of taste, but the nose identifies the flavor. Certain parts of the tongue are supposed to "register" certain types of flavor. The middle of the tongue is thought to register a sweet taste, the middle and back a bitter taste, the tip of the tongue a salty flavor, and the sides of the tongue a sour flavor.

Housewife Can Grow Her Own Herbs

The thrifty housewife may raise many of her herbs and other flavoring agents. She may reserve a little

corner in her garden for this purpose, or part of her window box in front of the kitchen window, or she may even use flower pots. Parsley and sage are easily grown perennials which will keep the household supplied when once started. Chives, shallots, leeks, onions and garlic may each be raised in the ordinary garden. Leeks are eaten green, but the others are usually dried and stored for winter use.

Green and red peppers may be grown without effort after the first planting. The red variety of pimento pepper may be preserved in vinegar to be used later in salads and sauces as "pimento." Dill is very inexpensive either to raise at home or buy on the market. Caraway and nasturtium seeds will be plentiful on even one plant of each. Dill and nasturtiums will seed themselves each year.

Should Increase Her Store

After reading the discussion in this column the farm housewife should have a desire to increase her stock of herbs, spices, and other flavoring agents. She may not want all of them at first, but she can keep adding to her store as she becomes familiar with the use of each new one. When she has a large number of them at hand and can use them together and separately, each in its particular place, always to achieve "different" yet appetizing results, she will have mastered the art of flavoring and seasoning. Her family and friends will bless her because her meals will always have zest, flavor and variety.

The ideal flavor usually results from a combination of herbs and spices and should have a tantalizing, elusive quality that defies efforts to identify it. The more unusual flavors should be used less often than the others, and no one flavor should be used too continuously. The only secret of success is to "Try and taste, try and taste, and try again."

Recipes for Prune Desserts

THE PRUNE is fast living down its "boarding house" reputation and is coming in for its rightful share of appreciation, not only because of its food value but for its delightful flavor as well. The once-despised prune is now justly famed for its health-giving qualities and its fine, delicate flavor achieved through proper methods of preparation. Canned prunes, put up by the cold-pack method and packed loosely in the jars to insure a mild flavor, make excellent pies, sauces and jellies. Dried prunes should be soaked over night in water to cover, then allowed to simmer just below the boiling point till tender in preparation for any sauce or dessert. Be sure to keep plenty of juice on them if they are to be used for sauce, otherwise they will be strong-flavored. Add very little sugar for prunes of any kind.

Prune Coconut Dessert

- 1 c. stewed pitted 2 eggs
- prunes 4 T. sugar
- 1 T. coconut 1 t. vanilla
- 2 graham crackers

Rub prunes through coarse sieve, add graham crackers rolled into crumbs, coconut and vanilla. Separate eggs, beat yolks till creamy and add to prune mixture. Beat whites until stiff and add sugar gradually. Fold half of meringue into prune mixture and spread in shallow buttered pan. Pile remaining meringue on top, sprinkle with sugar and coconut. Bake in moderate oven 10 minutes. Cool and cut into squares.

Prune Cake and Filling

- 1/2 c. butter 1 t. cinnamon
- 1 c. sugar 1/2 t. each of cloves
- 2 eggs and nutmeg
- 1 c. flour 1 c. prune pulp
- 1 t. baking powder

Cream butter, add sugar, and cream again. Add well beaten eggs; mix well. Add dry materials, sifted twice, and the prune pulp. Bake in loaf or layer pans in moderate oven. When cold put together with prune cake filling, or with whipped cream. Recipe will serve 8 persons. This cake is excellent for children's lunches.

Prune Filling

- 1 c. pitted prunes 1/2 c. chopped wal-
  - 1/2 c. orange mar- nuts
  - malade 1 t. lemon juice
- Put prunes through food grinder. Add other ingredients (and 1/4 c. powdered sugar, if desired). Spread between layers, or on top if baked as loaf cake.

Prunes with Tapioca

- 1/2 c. pearl tapioca 1 T. butter
- 1 c. cold water Cooked and pitted
- 1 c. hot water prunes
- 1/4 c. sugar

Soak tapioca in cold water 1 hour or more. Drain, add hot water, sugar and butter and cook in double boiler until tapioca is transparent. Butter baking dish, cover bottom with prunes and fill with tapioca. Bake in moderate oven about 30 minutes. Serve with cream or custard sauce. Recipe serves 4 persons. Canned prunes which have been drained and pitted would be even better served in this manner.

Prune Steamed Pudding

- 1 c. soft bread 3 eggs beaten sep-
- crumbs arately
- 1 c. chopped suet 1/4 c. citron
- 1 c. prune pulp 1/2 t. each salt, soda,
- 1/2 c. brown sugar nutmeg, cinnamon,
- 1 c. uncooked cloves, allspice
- chopped prunes 1/2 c. molasses

Sift flour, salt, soda and spices together and mix ingredients in order given. Fold in beaten egg whites last. Grease pudding mold, dredge with sugar, pour in mixture, adjust cover, and place on rack in kettle of boiling water. Steam about 3 hours, keeping the water boiling constantly. Serve hot with hard sauce. Recipe serves 8 persons.

Prune Coffee Cake

- 2 eggs 1/2 c. melted fat
- 1 c. sugar 1 t. vanilla
- 2 c. flour Soaked pitted prunes
- 2 t. baking powder Chopped walnuts
- 1/2 c. milk

Beat eggs, add sugar. Sift flour and baking powder and add to egg mixture alternately with milk. Beat until smooth and add shortening and vanilla. Pour into greased shallow baking pans, cover surface with pitted uncooked prunes and sprinkle with chopped nuts. Bake in moderate oven. Cake may be sliced and served with tea or coffee, or may be cut in squares and served with whipped cream as a dessert.

Prune Charlotte Russe

- Sponge cake in ring mold.
- 2 c. prune pulp 1 t. vanilla
- 1 pt. cream 1/2 c. chopped nuts

Bake a sponge cake in a ring mold or round pan. If latter is used, hollow out center of cake when cold to form ring. Cover cake with confectioners' sugar icing. To prune pulp add nuts and vanilla. Whip cream, fold into mixture and pile prune mixture high in center of cake ring. Recipe will serve 10 to 12 persons. For smaller group bake small cake and use half of recipe.

Table of Abbreviations

- 1 t. equals 1 teaspoonful.
- 1 T. equals 1 tablespoonful.
- 1 c. equals 1 cupful.
- 1 pt. equals 1 pint (2 standard cups).
- 1 qt. equals 1 quart (2 pints).
- All Measures Level

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## Apple Blotch and Its Treatment

(Continued from page 4)

In practice, Bordeaux has generally appeared to be better than lime-sulphur for blotch, which may be due to its greater adhesiveness and its effectiveness over a longer period of time. Its use is preferable to lime-sulphur for blotch control, particularly in heavily infected orchards. Therefore, the change from lime-sulphur to Bordeaux should be made as soon after the petal fall period as conditions and the variety will permit. Arsenate of lead should be included in all of the treatments to control the insects. Sulphur or copper dusts have so far proved to be ineffective in controlling blotch.

### Late Dormant Spray is Beneficial

In addition to the summer applications suggested, a late or delayed dormant application of either commercial lime-sulphur one to eight, or stronger, or bluestone solution containing one pound of crystals to 10 gallons of water, or stronger, will destroy a large percentage of spores that are destined to function after petal fall. The reason for partial control of blotch from the late dormant treatment may need some explanation. As previously mentioned, the cankers are dotted with numerous pimple-like spore sacs. Long before the buds show pink, the bark covering these spore sacs is ruptured by the growth of the fungus, causing them to become exposed. A covering of lime-sulphur or bluestone over the cankers, preferably when the buds are swelling and the tips are showing green, will penetrate the pustules and kill the spores in their hiding places before they have a chance to function. However, after the dormant period the cankers enlarge rapidly, producing simultaneously new sacs full of spores that are also destined to play an important part in infecting the current season's growth. Since these spores escape the late dormant treatment, summer sprays are necessary to prevent them from infecting the orchard. The practice of applying a late dormant spray or either lime-sulphur or copper sulphate seems very desirable in badly cankered orchards. This treatment is not essential to the control of the disease, although by its use fewer spores are present to infect the fruit, leaves and twigs during the current season. Dormant lime-sulphur offers an advantage over the strong bluestone solution in that both scale and blotch are combated with the same application; thus a dual purpose is served.

### Points to Remember in Spraying

The keynote of success in controlling apple blotch lies in keeping the surfaces of the fruit, foliage and growing twigs completely covered with spray before the blotch spores are spread. No fungicide, no matter how thoroughly applied, will keep blotch from developing on the current season's growth if applied after the spores have alighted and germinated on unprotected surfaces. Apple blotch spores, as previously mentioned, begin to spread from the winter-over cankers soon after the petals fall. During this heavy infection period the young apples enlarge rapidly and the twig growth develops fast. Frequent and thorough spraying is, therefore, necessary to keep the new growth protected. Failures in blotch control are due to delay in the first application and to making the applications too far apart. By keeping these facts in mind, and by using spraying equipment capable of developing a pressure of 250 pounds, growers need have little fear of apple blotch.

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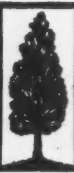
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## Fire Blight Can Be Controlled

(Continued from page 9)

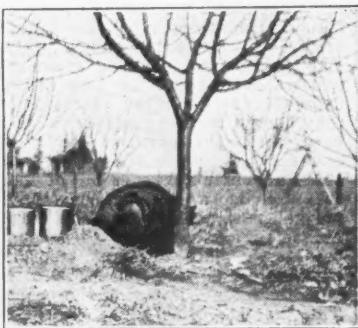
possible in the spring, although fall planting in mild climates is ideal. As soon as the bark will peel (slip) the tops of these trees may be put in place, tacked, waxed and almost forgotten except for the matter of removing lateral shoots that otherwise will grow out from them.

### Pruning in Conjunction with Blight Control

The surgical treatment of a severely infected tree will often constitute a heavy pruning, and usually additional pruning should not be practiced the same season. However, in the case of trees that have extensive injuries, possibly of long standing, so as to effect a partial girdling, good judgment may require heavier pruning to reduce the leaf area to be supported the first few seasons. Likewise, in most cases of severe girdling, the crop should be removed before July 1. However, in those rare cases in which trees have been making three to six feet of growth annually, it will often prove the part of good judgment to leave enough fruit to utilize some excess vigor. At any rate, allow judgment to be the guide.

### Tools

Very little equipment not found in any orchard tool shop will be needed. A farrier's knife and a good scraper, such as the "Dandy Box Scraper No.



The most important man in blight control is the blight scout. This man follows the crew, treating wounds and locating missed cankers.

15, a tile spade, chisels and mallet, and brush wax lamp, such as the Merribrooke Melter, are the main essentials. Experienced blight cutters carry very few tools. Ladders, shears and saws are, of course, always used.

### Grafting Wax

It is not necessary to go into details here regarding grafting procedure. Those who wish information along this line may obtain it from state or federal bulletins. However, the type of wax used is rather important, so a good formula is not out of place here. The following ingredients may be varied to suit conditions of climate:

- 5 pounds resin.
- 1 pound beeswax.
- 1/2 pint raw linseed oil.
- 1/2 pound lamp black.

Place the first three ingredients in a (dry) kettle and melt. Remove from the fire and stir in the lamp black. Pour into shallow pans to cool. Break to sizes suitable for the heater used. It must be applied while warm; a half-inch brush is suggested.

### Spring and Summer Care

It is especially important that a good blight scout (someone who can recognize all stages of the disease) examine every tree in the orchard a week before the blossoms open to locate and remove any missed cankers from which bacterial exudate may be flowing. Throughout the blossoming period the orchard should be gone over weekly. Then blight may be forgotten until the following fall. Summer cutting is rarely profitable in most fruit districts, except in the case of the young, vigorous, non-bearing pear or apple orchard.

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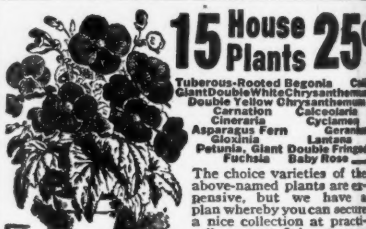
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The choice varieties of the above-named plants are expensive, but we have a plan whereby you can secure a nice collection at practically no cost. It is not necessary to pay enormous prices for plants, for all can be grown from seed. Florists grow these plants from seed, and as soon as up and well rooted, sell them at high prices. You can grow them in the house easily and successfully, so there is no reason why you should not have as fine or a better collection of choice house plants than anyone else in your community. We will send you our House Plant Seed Packet, containing a few seeds of all the above house plants, for only 25¢. This is less money than you would pay a florist for one plant. Were you to buy these seeds in full-size separate packets, this assortment would cost you over \$2.00, as many varieties of house plant seeds are hard to get and very expensive. With each packet we send full directions for planting the seed and caring for same. We have a good stock of seed and expect to be able to supply all customers, but should we run out of one or more of the varieties named, we reserve the right to substitute other choice varieties of equal value or return your money. Send your 25¢ today. Catalog of seeds and plants free. Burgess Seed & Plant Co., 239 H. P., Galesburg, Michigan.



## NEW GIANT SHAGGY ASTERS

All Shades, All Colors, Mammoth Flowers. We tell you how to grow them. Write today—we will send you enough seed to grow 150 beautiful Giant Shaggy Asters. Also Big 1926 Garden Guide. Tells how, when, and what to plant. Send two cents in stamps to cover postage. Back River Valley Seed Co., CONDON BROS., Seedsmen, Box 401, Rockford, Ill.

## 30 VARIETIES STRAWBERRY PLANTS

\$3.00, 1000 up. Raspberries, Grapes, Ornamentals, Bulbs, Garden and Flower Seeds. No better plants anywhere. Catalog.

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Baskets for Apples, Peaches, Plums, Grapes, Tomatoes, Cucumbers, Beans, etc. Boxes and Crates for Berries, Cucumbers, Celery, Cauliflower and vegetables of all kinds.

**PLANT BOXES**  
Catalog mailed on request  
**The Pierce-Williams Co.** South Haven, Mich. Jonesboro, Ark.

need of all wound dormant. However, it is fully disinfectant, swab the ing a w after the bark, rat before ea is followe F. C. R ment Sta by L. H. lege of A Dissolv cyanide warm wa merical g sired for bark, add bichloride formula.

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need of using a disinfectant to treat all wounds when working during the dormant period in cold climates. However, in early spring or summer it is folly to work without a reliable disinfectant. The writer prefers to swab the freshly cut bark surrounding a wound with the disinfectant after the case is freed of diseased bark, rather than smearing the tools before each cut. Where this method is followed, the formula developed by F. C. Reimer, of the Oregon Experiment Station, and possibly improved by L. H. Day, of the California College of Agriculture, is recommended.

Dissolve eight half-gram tablets of cyanide of mercury in one pint of warm water. Add three pints of commercial glycerin. If a solution is desired for disinfecting both tools and bark, add eight half-gram tablets of bichloride of mercury to the above formula.

The whole procedure sounds simple and easy. It is, and yet may not be. It is easy, and results are certain when and if two very important requirements are met. The one who does the work must know how to recognize blight cankers, and he must do his work thoroughly. Failure in either respect may mean failure to control the disease. Experience demonstrates conclusively that the best way for the individual grower to acquire skill in blight cutting is to spend a week working with an old "wheel horse"—an experienced operator. Practice in blight removal brings reward, as in other things.

### Feeding Baby Chicks

(Continued from page 44)

If eggs are available, continue to feed them until the chicks are six weeks of age.

#### BREEDERS—SIXTH TO TWELFTH WEEK.

Grain—	Pounds.
Cracked corn.....	66
Whole wheat.....	34
Mash—	Pounds.
Standard middlings.....	25
Corn meal.....	25
Oat flour.....	25
Meat scraps and dried buttermilk.....	10
Ground limestone.....	4
Bone meal.....	2
Charcoal.....	2
Salt.....	1

Let it be a rule for one person to do the brooding and feeding.

At the end of six weeks, there is a change of feeding for the birds that are to be kept as breeders while the broiler birds are continued on the same mash as before in order to get the greatest gain in the shortest time. Breeding birds need not be crowded so heavily and are placed on a ration somewhat wider in nutritive value in order not to bring them into production before they are fully developed.

The grain ration is changed at the beginning of the tenth day, but the change should be made gradually so as to avoid throwing the birds off feed.

After six weeks give the birds access to either milk or water to drink, as their appetite dictates.

Baby chicks are very susceptible to all kinds of infection. It is very essential that all drinking fountains, mash hoppers, and the house itself be kept clean and sanitary. Stronger, healthier chicks and more rapid growth will be obtained when chicks are given outdoor range, provided that the ground has not been contaminated by older chickens. Otherwise it is best to confine the chicks within the house until they are six weeks of age. If possible, put your brooder house where you can raise your chicks on fresh ground.

THERE are now 578 radio broadcasting stations in operation in the United States. Today every solitary channel of the air is occupied by at least one broadcasting station and there are now pending before the United States Department of Commerce more than 175 applications for new licenses. Experience and experiments have found that there are only 89 distinct wave lengths to serve all who wish to use the air at one time. It is estimated that \$50,000 is spent every night to fill the radio ears of this country.

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Insecticide and fungicide spraying is war—and a serious one. To clean out the enemy you've got to use high power ammunition, and nothing less. It does no good to spend money on honest labor and indifferent spray materials. You must have effectiveness—killing power—and you will profit by following the example of such careful orchardists as



American Fruit Growers, Inc.,  
who standardize on

## ORCHARD BRAND INSECTICIDES and FUNGICIDES

They know, and you know, too, that the General Chemical Company has built up a nation-wide reputation for Quality. And with our excellent factory equipment and volume output we are able to give you that Quality at a price which is often no higher than you are asked to pay for untried materials.

Plan now to make the 1926 harvest the best crop you have ever marketed. You'll be surer of it, if you use Orchard Brand Sprays and Dusts.

### Use Orchard Brand Dritomic Sulphur

through the growing and ripening season, either alone or with Orchard Brand Arsenate of Lead. It is the most effective sulphur fungicide you can buy, because it is very highly concentrated (90% available sulphur) and is dry packed in 4 lb. bags. You save labor and use less of the material. It will make your crop command top prices. Ask your dealer, or write us for a descriptive circular.

Dealers everywhere stock and recommend Orchard Brand Spray and Dust Materials. If yours cannot supply you, write us direct.

**GENERAL CHEMICAL COMPANY**  
NEW YORK ST. LOUIS SAN FRANCISCO LOS ANGELES



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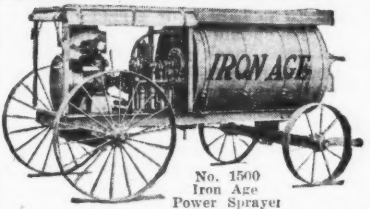
is a brand of reliability on

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Lime Sulphur Solution  
Bordeaux Mixture  
Arsenate of Lead

#### B T S

(A Dry Substitute for Lime Sulphur Solution)

Arsenate of Zinc  
Atomic Sulphur  
Dritomic Sulphur  
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have the same good reputation for giving dependable service enjoyed by all the rest of the

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Fan is ball bearing and the hub is packed in grease. The hopper holds seven pounds and the discharge can be regulated from nothing to twenty pounds per acre. Just the thing for plants, bushes and medium size trees.

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Peerless cuisine, superb music and carefree comfort—make this your New York home.

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Front view

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CUTAWAY

## TRACTOR ORCHARD PLOW

You can now cultivate your orchard close to the trees without damage to the low-hanging branches.

For the Clark "Cutaway" Tractor Orchard Plow, built especially for this kind of work, is equipped with a galvanized sheet iron guard, curved to gently lift the branches over the machine without injury.

And because it can be worked close to the trees it quickly levels and pulverizes the ridges that have been built up through years of plowing.

The picture shows the disks pulling the soil away from the trees, but the gangs can be reversed to throw it toward the trees.

### PLOWS AND HARROWS IN ONE OPERATION

The Clark "Cutaway" Tractor Orchard Plow is ideal for breaking old hard sod. And as it will disk in a cover crop without requiring harrowing afterwards it saves time, labor and money.

### OUTSTANDING FEATURES

Large underslung weight box, conveniently carries as much weight as necessary for deep penetration on heavy work.

18-inch flat Coulters Disks absorb the side thrust and keep the machine running straight. These disks may be angled if necessary.

Forged Disks. All disks, whether Cutaway or solid, made of cutlery steel, forged sharp instead of rolled, prevents cracking, bending or chipping.

Disks equipped with scraper which automatically cleans them and turns the furrows.

### MAIL COUPON

Mail coupon for further information about the Clark Cutaway Tractor Orchard Plow (also made for horses) and valuable free book, "The Soil and Its Tillage."

Cutaway Harrow Company, 137 Main St., Higganum, Conn.



Rear view

**BUILT ESPECIALLY FOR ORCHARD WORK**

## Engineering for the Fruit Grower

By E. W. Lehmann

### Applying Spray Materials

THE REQUIREMENTS of good spraying might be briefly set forth as follows: (1) use proper spray materials for the purpose intended; (2) apply the materials when conditions are right; and (3) apply the material effectively. In this brief article, we are interested primarily in the third requirement, in which the mechanics of the job are involved.

### Equipment an Important Factor

Like every other phase of agriculture or horticulture, the equipment used is an important factor. Adequate equipment for one job and one set of conditions may be entirely inadequate for another. The lack of proper equipment limits the operator to a small area and a few trees, and it may reduce the effectiveness of his work and result in a poor quality product. In many home orchards, the spraying job is entirely neglected, due to lack of equipment, and the fruit produced is of little or no value.

To provide proper spray equipment with which to do a good job, the fruit grower will have to have a sufficiently large orchard to justify an investment in a power sprayer to take care of his own trees or organize a co-operative spray ring or hire a custom sprayer. The co-operative spray ring has made it possible in many communities for the farmer with a small orchard to have the benefits of high class equipment. In some localities the custom sprayer renders a real service by spraying the small home orchards at a small charge per tree.

To do a good job of spraying, the machine must be in first class shape. The time to check up on a sprayer is at the completion of the spraying season. If the machinery is thoroughly cleaned and put in shape at that time, little trouble should be experienced when it is necessary to start spraying the following year. It is always a good idea to see that the motor is in good running order and that all the gaskets and packing on the pump are in first class condition.

The aim in the job of spraying should be to apply the spray material so effectively that no insect or disease that the spray solution will affect can escape. While the machinery and equipment are important in getting this result, the operator must recognize the fact that the real success of the job depends as much or more on himself as on the machine. One man who is careful in operating a machine in poor condition, or who has inadequate equipment, may get better results than a careless man who is operating a high class machine in perfect condition.

A power sprayer operator, to really do a high class job, should be patient, careful, painstaking and give close attention to detail. He should not be afraid to get dirty or afraid of hard work. He should have a pair of strong arms and a neck that will stand the strain. He should have mechanical ability to be able to keep his machine in first class running order, and he should be thorough. The fruit grower must never overlook the fact that much of his success is dependent on the effectiveness of his spraying operations.

### Provide Ice If Possible

WHILE it is not possible for us to store up any of the warm breezes and the heat of the July sun for our use during this time of the year, it is possible for those living in the northern half of our country to store up a supply of ice for use during the summer months. There is a lot of satisfaction in knowing that there is a supply of ice stored away that will take away some of the bad effects of the summer heat.

The principal reasons for providing a supply of ice have been outlined as follows: (1) To cool milk and cream; (2) to preserve butter, eggs, meats and fruits; (3) to make possible a greater variety of food; (4) to make it possible for the farmer to market his products at will; (5) to make home-made ice cream and other frozen desserts possible without having to go to town; and (6) to use in case of sickness.

Some means of refrigeration has become a necessity in many homes. The small electric refrigerator is filling this need in some homes, but the lack of electric power, the first cost and the operating expense are all factors that will limit its use for some time to come. A supply of ice is the simplest method of refrigeration.

Farmers' Bulletin 623, published by the United States Department of Agriculture, outlines in detail methods of harvesting ice and also gives plans of different types of ice houses. Three types of houses are found in use, those entirely above ground, those partly above and partly below ground, and those entirely below ground. Local conditions, needs, drainage, etc., determine the type of house to build. Most large ice storage houses for storing a city supply are built above ground.

In harvesting ice on a large scale, power saws are used and the large cakes of ice are elevated into the house by endless conveyors. In storing ice for home use, saws, ice tongs, hooks and a pointed bar are needed. It is well to cut the ice into uniform rectangular-shaped cakes that can be stored readily and easily handled by one man.

In storing the ice, put the pieces as close together as possible and fill all cracks and open spaces between the pieces. To avoid excessive melting of ice in storage, the circulation of air must be prevented. The amount of insulating material needed will depend somewhat on the construction of the house. Sawdust, shavings and chopped straw may be used for packing. Ordinarily it is a good plan to leave a space of about one foot or more between the pile of ice and the wall, this space to be filled with packing material. While air circulation should be avoided, drainage and ventilation are essential.

### Adjust Carburetor and Save Fuel

THERE are few automobile and tractor operators who realize the waste of fuel and the motor troubles that are a result of improper carburetor adjustment. Many carburetors are adjusted for a rich mixture for easy starting in cold weather, and when operated under these conditions there is not only an excessive waste of fuel, but many other troubles develop. One of the most noticeable results is that the motor runs uneven, or lopes and is sluggish. The spark plugs become fouled very quickly and the motor fills up with carbon, causing knocking. Another objection to a rich mixture is that the excess fuel dilutes the oil, causing poor lubrication, more rapid engine wear, and loss of power.

A carburetor is never adjusted too lean as long as the motor delivers its rated power and operates satisfactorily. One of the common noticeable characteristics of a lean mixture is that the engine misfires and often it explodes or pops back through the carburetor. In a lean mixture there is too much air for the amount of fuel and in a rich mixture there is too little air for the amount of fuel. A correct mixture must have the proper proportion of fuel and air for complete combustion.

Prof. R. I. Shawl of the Department of Farm Mechanics, University of Illinois, has outlined the following

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procedure in adjusting a carburetor: Turn down the needle valve until it seats lightly, then open about one and one-half turns. Start the motor, advance the spark and allow it to warm up thoroughly. If black smoke comes from the exhaust, turn the needle valve down a little. When the motor has warmed up, close the throttle lever about two-thirds and turn down the needle valve until the engine begins to pop and misfire, then open the needle valve about one-sixteenth of a turn or until the popping stops. Now close the throttle lever and see if the engine will pick up to full speed without misfiring, when the throttle is opened wide for a few seconds. If not, open the needle valve a notch or two and try again. The engine should pick up speed quickly without missing. Open the throttle about halfway and try closing the needle valve a little. If it slows down the speed of the engine, open it slightly until the speed picks up again. It is always best to try closing the needle valve down slightly when the engine is under load. This setting will be correct for all loads on the engine. In cold weather use the choker for starting until the motor warms up, but if the engine will not operate satisfactorily, the needle valve can be opened slightly."

## New York Society Holds Great Meeting

(Continued from page 22)

the Civil and Napoleonic wars. Dr. Warren believes export legislation inadvisable from a permanent standpoint but that it might be all right temporarily. He thinks agriculture is as much justified as industry in having the principles of the tariff applied through government legislation. He believes that an export corporation would raise price levels for agricultural products. The methods of taxation in New York and elsewhere deserve study and revision, according to Dr. Warren. He approved the taxation plans of the state farm bureau federation, which call for the diversion of more state tax funds to community development.

E. R. Eastman, Editor of the *American Agriculturist*, gave an interesting address on, "Twenty-five Years of Farm Progress." "The Farmer and Economic Law" was the title of an address given by Dr. W. H. Jordan, formerly director of the New York State Agricultural Experiment Station. He opposed legislation for the handling of surplus products. He believes agriculture is suffering because of lack of organization and that co-operative methods should be developed as rapidly as possible. A feature of his address with which I cannot agree is the tendency he displayed to encourage sectional opposition. In view of the great problems before agriculture, we should encourage unity of action between different agricultural sections and not sectional antagonism. While the interests of certain sections may to some extent be opposed, the larger problems of agriculture greatly outweigh these relatively small differences. Eastern farmers and fruit growers are having difficulties as well as those in other sections, and they will continue to do so until agriculture receives a more just division of the national income than it is now receiving. To bring about such a condition, the farmers and fruit growers of the entire country need to act together in a closer way than they have ever done before.

Other important addresses were given by Frame C. Brown of Ohio; by Richard Wellington, R. W. Rees, H. B. Tukey, F. E. Gladwin and E. W. J. Hearty of New York; by L. K. Jones of Wisconsin; and by others.

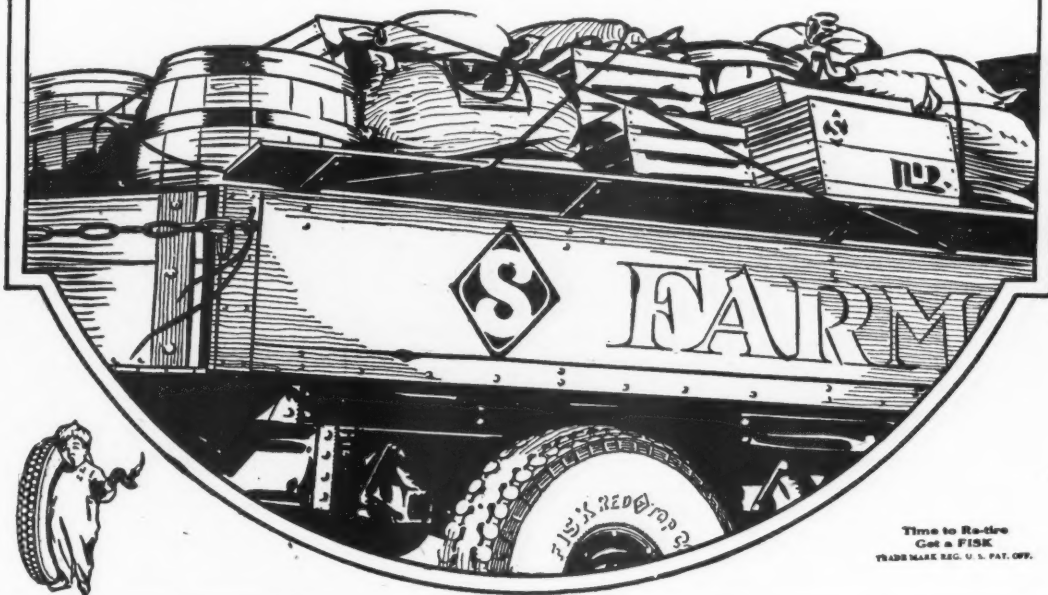
The following officers were elected: President, E. W. Mitchell; First Vice-President, J. G. Case; Second Vice-President, M. C. Burritt; Third Vice-President, Hall Judson; Fourth Vice-President, W. J. Hall; Secretary, Roy P. McPherson. Executive Committee: W. D. Chase, T. E. Cross, Roscoe Teator, C. G. Wooster, J. Roe Stevenson, and Frank Mason.

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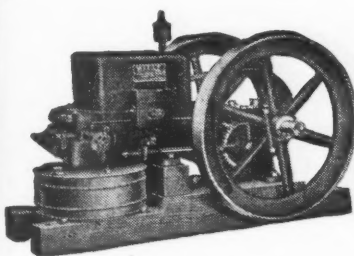
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**FREE—SEND NAME AND GET 25 PEDIGREED** everbearing strawberry plants, free. West Plains Nursery Co., West Plains, Mo.

## Essentials of Insect Control

(Continued from page 3)

chard. He sprayed twice with a standard miscible oil, once in the fall and again in the spring, but in spite of this treatment many trees died in his orchard the following season as a result of scale attacks. What was the reason? The equipment used was satisfactory, the material used was good, the time of application was right. The operator fell down on his method of application. He sprayed the outside of the trees but failed in thoroughly spraying the tops and centers of the trees. As a result, the live scale left on the trees increased rapidly the following season and soon encrusted the whole tree, killing many branches and in some cases completely killing the



Plant lice, plant bugs, scale insects and other pests of this nature are unable to take solid food into their stomachs. Their food must be taken in liquid form through the hair-like tubes with which they puncture the tissues. They cannot be controlled with poisons placed on the foliage but must be treated with nicotine, lime-sulphur or oil sprays capable of killing by contact. (Reproduced from Silgerland and Crosby's "Manual of Fruit Insects," published by the Macmillan Company, New York)

trees, causing an immense loss. A knowledge of the San Jose scale, its life history, rapid reproduction and necessity of complete control would have explained the need of thoroughness, and if the operator had applied this knowledge in his spraying, the immense loss resulting would have been avoided.

The grower will find it to his advantage to have an understanding of insect controls and how they are grouped.

In the first place, the controls are grouped as natural and artificial.

### Natural Controls

By natural controls we refer to climatic factors and natural enemies which are usually beyond our artificial control. Climatic factors include winter conditions, humidity, soil moisture, precipitation, wind and seasonal weather. These various factors affect different insects differently and may affect the same insect differently in different localities. Thus, an exposed insect as the San Jose scale may have a winter mortality which fluctuates approximately as does the severity of winter weather, while the mortality of hibernating curculios, tucked away under grass and rubbish, may not be affected much differently in mild or severe winters. Or, the effect of a 75 per cent winter mortality of the San Jose scale may be sufficient to hold the insect in check the following summer in areas where, because of the short season or for other reasons, the scale does not multiply rapidly, while a 75 per cent winter mortality of the San Jose scale in southern Illinois or southern Indiana where the scale reproduces as rapidly would have little effect on the numbers the following season.

Each of these climatic factors plays

## Classified Advertising

### NURSERY (Continued)

**PLANT PAPERSHELL PECAN TREES FOR** big profit. Sure, safe and permanent investment. Free catalogue. Bass Pecan Nursery, Lomberton, Miss.

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**WANTED—TO HEAR FROM OWNER OF FARM** for sale for spring delivery. O. Hawley, Berlin, Wis.

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**BABY CHICKS From 200- Egg Hens.**

Chicks from winter laying, farm raised, mature and White Wyandottes, White Rocks, Black Rocks, S. C. W. Leghorns, R. I. Reds, Barred Rocks, White Orpingtons, Anconas, Black Jersey Dicks, Indian Runner Ducks, \$15 per 100 up, Main Ducks. Live delivery guaranteed. Parcel post prepaid. Hatching eggs, \$8 and up per 100. Circular Free.

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Beautiful Catalog entitled, "The Art of Poultry Raising," Free. 20 Best Varieties. 68 won 28 ribbons in 1925. Buy Winning. Laying, Profit Paying "Geneva" Chicks for sale. Bred, hatched and shipped under our personal supervision. \$9.50 per 100 and up. Postpaid. Full guarantee. Reference—Bank of Geneva, Mem. L.R.C.A.

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Bred from heavy producing, pure bred stock. Bred and fed to insure vigor in the chicks. Varieties: Leghorns, Rocks, Reds, Wyandottes, Orpingtons, Minorcas, etc. Thousands of customers everywhere. Moderate prices. Live Arrival Guaranteed. Fine Instructional Catalog Free.

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Accredited. Heavy laying strains. 14 years of satisfied customers in 48 states. 100% P.O. order. Price \$5 on really good chicks. 14 popular varieties. Big illustrated catalog free.

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an important role in the checking of some one or more insects and the interrelation between the insects is one which should have a better understanding among orchardists. Natural enemies likewise play an important part in holding in check many insects which would otherwise be serious pests. As Dr. Howard, Chief of the United States Bureau of Entomology, has so aptly said, if insects would quit fighting among themselves, referring, of course, to the parasites and other natural enemies of harmful kinds, they would soon overrun the earth. Fortunately, the natural enemies are effective checks for most insects and sudden outbreaks are not due to weather conditions favorable to the insect so much as to unfavorable conditions for the natural enemies which naturally hold them in check. Control of insect pests by means of natural enemies is referred to as the biological method of control. The biological control is seldom applicable in an artificial way, but certainly a knowledge of the conditions which are favorable to the parasites will enable the individual grower to follow such methods which will in-



Caterpillars, beetles, grasshoppers and similar insects have eating mouth parts and cut off portions of plant tissues to be taken into the stomach. Such insects must be controlled with stomach poisons. (Reproduced from Slingerland and Crosby's "Manual of Fruit Insects," published by the Macmillan Company, New York)

crease the efficiency of these natural enemies.

**Artificial Controls**

For convenience, we may group the artificial controls as (1) farm practices; (2) mechanical methods and devices (other than equipment for applying insecticides); and (3) insecticides.

Farm practices, which in the case of the fruit grower can be termed orchard practices, are of increasing importance in insect control. For many years farm practices have been recognized as of greatest importance in the control of insects attacking field crops, because such crops are too extensive to permit use of insecticides as a general rule. And, to be sure, we have come to learn that the good farm practices are usually those which are best for the control of insects. More and more must we recognize orchard practices as of real significance in the control of orchard infesting insects. Cultivation at the proper season destroys the pupa of the curculio in its earthen cell. Use of resistant varieties is of some value, although not of vital importance. Orchard sanitation, such as removal of favorable hibernating places for the codling moth and curculio, is an item which must not be overlooked. Cover crops have an important effect on insect infestations but need more consideration before much can be recommended as general practices. For example, alfalfa in apple orchards is undoubtedly favorable for the buffalo tree hopper, certain leaf-tyers and field mice. Methods such as cultivation, fertilization, spraying and pruning, which will invigorate the tree, will have an effect on the increase of certain insects. Thus, we find that injury by the flat-headed apple tree borer and certain other borers is confined largely to

trees which are unthrifty or which have been weakened for some reason.

Certainly there awaits the investigator a large field in the study of practices in relation to insect abundance, and no doubt there will be a big use of this method of insect control as our knowledge of insects and their relation to different environments increases.

Mechanical methods have been used from the earliest times. The house screen, used to secure protection indoors from flies and mosquitoes, is one of the best known mechanical protectors. It was recently estimated that 550,000,000 square feet of screen wire are used each year for screening houses. Grasshopper catchers, screen plant covers and insect-proof packages used for protecting cereals and the like, are common examples of mechanical methods used in insect control. They are important methods, but few are useful in fruit growing.

Insecticides are pre-eminently the most useful for the orchardist. An insecticide might be defined as any material used to destroy insects or to prevent insect injury. They may be applied as a liquid spray or as a dust, and in the case of stomach poisons they are sometimes mixed with attractive foods and used as poison baits.

To enumerate the many insecticides and fully explain their action on insects would require considerable space. In this connection we may list only the general types and uses. The majority of insecticides used by the fruit growers may be referred to as stomach poisons and contact insecticides. Stomach poisons include Paris green, arsenate of lead, calcium arsenate and sodium fluoride and are commonly used for the con-

trol of insects with chewing mouth parts, that is, insects such as caterpillars, beetles and grasshoppers, which bite off portions of the plant tissue and take it into their stomachs. Contact insecticides include soaps, oils, lime-sulphur and nicotine and are generally used against insects with sucking mouth parts and soft bodied insects in general which take into their digestive system only plant or animal juices. In this case the insecticide must kill the insect by direct or indirect contact, usually by the volatile materials entering the breathing pores of the insects and destroying the cells.

Several other insecticides are useful for special purposes and under special conditions but less useful in the orchard. These include fumigants, such as hydrocyanic acid gas, carbon bisulphide, nicotine vapor, sulphur fumes, calcium cyanide and heat, which are used for the control of insects in enclosed spaces, as in granaries, mills, warehouses, dwellings and specially constructed rooms or boxes. Soil insecticides include paradichlorobenzene, carbon bisulphide and sodium cyanide, used alone or as special emulsions to destroy insects living in the soil and which cannot be reached by other means. Repellents include Bordeaux mixture, creosote compounds of one kind or another and pennyroyal oil, and are materials distasteful or otherwise repellent to insects. Finally, we may often combine two or more kinds of insecticides or insecticides and fungicides to destroy two or more types of insects or insects and plant diseases, with a single application. Needless to say, insecticides cannot be promiscuously mixed or combined and only recommended combinations should be used by the grower.

# War brought him his pipe-tobacco thrill

English Tommy introduced to a certain American tobacco by friendly Doughboy in France

While Mr. Ellender of London isn't in favor of war for the purpose of finding a better tobacco, nevertheless one of the unforgettable memories of the last one seems to be his discovery of Edgeworth.

And the fact that Edgeworth tobacco is available throughout most of Europe has made it possible since the war for this Londoner to enjoy his pipe of peace. Read his "hands-across-the-sea" letter:

Larus & Bro. Co.  
Richmond, Va., U. S. A.  
Gentlemen:

I've just read in a magazine the remarkable letter of the traveling man in Seattle, who smoked five-eighths of a ton of Edgeworth tobacco.

Until early 1918 I didn't know that such pipe tobacco as Edgeworth was waiting to be enjoyed.

It was a U. S. Army man who gave me my first can, and with the idea that it couldn't be as good as the usual tobacco I had smoked since 1911, I decided to try a pipe.

I've smoked all kinds of tobacco during the war with the British Army. I even smoked tea leaves when I couldn't get tobacco—in fact, I smoked anything that would fill a pipe, but Edgeworth won all battles.

Right from the first can I've kept to Edgeworth at Base 3, Headquarters Section of the United States Army.

Your traveling man didn't have any trouble to obtain his supplies like I have had. Running around England for a dealer who stocked Edgeworth is not an easy run, but I have been amply rewarded when a dealer did say, "Yes, I have a stock."

Edgeworth doesn't bite the tongue—doesn't give that thirsty-after-smoking feeling, satisfies always, and always comes in tip-top condition. I have to hide my can for others like it like I do but I cannot afford to supply them all. Let them search for it like I have done. Then they will enjoy it better.

Yours very sincerely,  
Theodore Ellender.

Some pipe smokers get acquainted with Edgeworth accidentally, some deliberately, and others have "just always smoked Edgeworth."

If you haven't been introduced to Edgeworth as yet, here's a suggestion.

Let us send you free samples of Edgeworth so that you may put it to the pipe test. If you like the samples, you'll like Edgeworth wherever and whenever you buy it, for it never changes in quality. Write your name and address to Larus & Brother Company, 13-N South 21st Street, Richmond, Va.

We'll be grateful for the name and address of your tobacco dealer, too, if you care to add them.

Edgeworth is sold in various sizes to suit the needs and means of all purchasers. Both Edgeworth Plug Slice and Edgeworth Ready-Rubbed are packed in small, pocket-size packages, in handsome humidor holding a pound, and also in several handy in-between sizes.

To Retail Tobacco Merchants: If your jobber cannot supply you with Edgeworth, Larus & Brother Company will gladly send you prepaid by parcel post a one- or two-dozen carton of any size of Edgeworth Plug Slice or Edgeworth Ready-Rubbed for the same price as you would pay the jobber.

[On your radio—tune in on WRVA, Richmond, Va.—the Edgeworth station. Wave length 256 meters.]





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And while protecting your orchard, don't forget your truck crops and small fruit—they also need spraying at this time.

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## Bee Keeping for Fruit Growers



By H. F. Wilson

### A Talk With Beekeepers

NOW THAT the days are short and the nights long, and the chill winds sweep down from the north, let us gather around the fire and work with the bees. Working with the bees at this time of the year is a pleasant and profitable occupation. I imagine there are very few of us who do not long for that time of the year to come again when we can hear the lazy buzz of the drones as they fly haphazardly through the air. It is easy to make plans under these conditions. Many beekeepers are already making plans for next year, but only a few of them have perhaps done anything toward the completion of these plans.

#### Warm Winter Quarters Should Be Provided

Whether or not we keep bees to fertilize the orchard and other crops on the farm, or for the crop of honey, we should, in any case, attempt to do our best, and this we cannot do without making plans beforehand. Even now, I wonder if all of you have your bees in good warm winter quarters or whether they are standing, unprotected, out in the cold winds and snow.

Let us for a minute look into the cluster as it appears today. The temperature is down to 10 degrees below zero Fahrenheit. The bees are snugly clustered in the hive, with the queen inside the cluster and a closely fitting layer of bees around the outside. I have for several hours sat in a nice comfortable chair in a warm room in the laboratory watching a series of electrical thermometers connected with the inside of two hives just outside the laboratory window. One of these colonies is without any protection, being in a single-walled hive; the other colony has seven inches of shavings surrounding it on all sides and the top and bottom. The temperature is gradually going down, getting colder and colder. In each hive the bees have clustered more tightly together, the area which they occupied becoming smaller and the temperature in the center of each cluster rising higher and higher. However, later, there is quite a difference in the action of the two colonies and the temperature surrounding them inside the hive. All about the cluster in the unpacked hive the temperature is near zero Fahrenheit, while the temperature surrounding the cluster in the packed hive is only slightly below 32 degrees Fahrenheit. In the packed colony the bees are able to keep a uniform temperature and the highest temperature in the cluster remains at about 87 degrees Fahrenheit. This is a normal condition and the bees in this cluster are not undergoing extreme conditions; but the conditions in the unpacked hive tell a different story.

As the temperature outside the hive continued to go down, the highest temperature in the colony reached 87 degrees Fahrenheit, and has now fallen off to about 82. This shows that the bees in this unpacked hive cannot keep up a normal high temperature and that the bees are being over-taxed to keep up the colony warmth. They are just able, by working very hard, to keep the temperature from going down to a point at which they could no longer live. As the temperature rises outside, the temperature in the cluster will also rise again to a normal point of about 87 degrees Fahrenheit and will not be permitted by the bees to go any higher. At about this temperature the cluster gradually loosens and as long as they can keep

the temperature up to this point, there is no longer any danger of the colony freezing. But, although the colony has been able to keep alive, it has been badly over-taxed and a great deal of unnecessary energy and stores used in producing heat.

Investigations of previous years show that only about 18 pounds of stores are used by a colony with seven inches of packing, while 31 pounds of stores are used by the unpacked colony. This difference in stores indicates clearly the difference in the amount of energy required by each colony to keep warm. During the winter period, bees use very little stores, except in the necessary production of heat to keep the cluster from freezing. And since the one colony used 13 pounds more of stores than the other, then they must have used up just that extra amount of energy in feeding and heat production. This same condition holds true in the bee cellar, and if the stores are not good and the temperatures are low, you are sure to lose a good many bees which could have been saved by better care.

As soon as you have finished reading, go down into your bee cellar and look at the thermometer. Perhaps you do not have a thermometer in the cellar. If not, you should immediately see that one is provided. If the temperature is below 40 to 50 degrees Fahrenheit, then you should improve your cellar next year so that you can keep a steady temperature near these points. If you have your bees packed out of doors and you neglected to give them the proper attention in the fall, then your conscience is already bothering you, and it will not be necessary for you to go and take a look to see whether or not they appear to be uncomfortable. If you did not provide from six to seven inches of packing on all sides and at the top and bottom of every hive, then you may be sure that the bees have suffered greatly during the period when the temperature was down below zero, and that they have lost a great deal of energy which might have been saved. This energy used in rearing bees this spring would mean an increased number of bees in June and July when the honey flow is on.

"Keep better bees and keep them better," is a good motto for every beekeeper to adopt. Success in every agricultural pursuit today depends upon the individual being able to meet competition.

Supply and demand of any product sets the selling prices and increased demand can only be brought about either by an absolute need or through advertising, which will make the public believe that they need something which may or may not be necessary for their welfare. When prices are low, the competition must be met by increased production at a minimum cost. Wasted energy and stores in the bee colony not only increase the cost of production but greatly reduce the volume. If you are compelled to sell your honey cheap, then you must produce it cheaper or it becomes an unprofitable business. This, in spite of the fact that there are very few agricultural lines in which the returns are as great for the amount of money invested and the energy expended as in beekeeping.

Whether you keep bees for pleasure or for profit, a great deal more pleasure will be secured if you know that your bees are properly cared for and that a comfortable return is being secured.

## Protect Your Crops Against Fruit Pests

APPLES, peaches, currants, small fruits of every kind, potatoes, cabbages, and garden truck can best be protected against insects and fungus by using Dow Insecticides and fungicides. They have been used by leading orchardists for years.

Dow Powdered Lime Sulphur eliminates the mess and heavy labor of lime sulphur solution yet is very effective. Dow Powdered Lead Arsenate is deadly to all leaf eating and chewing insects.

Paradow gets the peach tree borer.

Bordow is a ready to use copper fungicide.

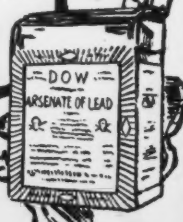
Dowco is a double purpose Spray combining insecticide and fungicide treatment at the one spraying.

Calcium Arsenate eliminates the boll weevil.

Be sure and send for the Dow Spray Chart, it's full of helpful information and tells how to control the pests that destroy your fruit.

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